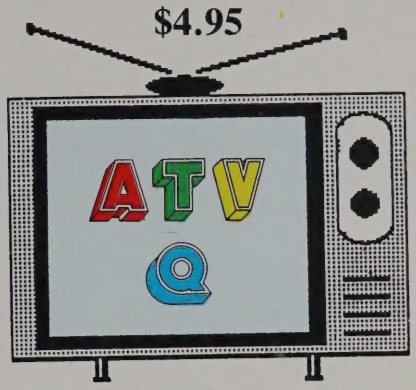
AMATEUR TELEVISION QUARTERLY

SPRING 1992
APRIL, MAY, JUNE
VOLUME 5 #2

$4.95



ISSN 1042-198X
USPS 003-353

The 1992 Rose Parade by ATV Camera position 6 Full story inside
Build: complete color video processor; 900 MHz. atv power amp.
All about Vestigial sideband signals. >>>

THE BEST OF BOTH WORLDS.

The pacesetting IC-R9000 truly reflects ICOM's long-term commitment to excellence. This single-cabinet receiver covers both local area VHF/UHF and worldwide MF/HF bands. It's a natural first choice for elaborate communications centers, professional service facilities and serious home setups alike. Test-tune ICOM's IC-R9000 and experience a totally new dimension in top-of-the-line receiver performance!

Complete Communications Receiver. Covers 100KHz to 1999.8MHz, all modes, all frequencies! The general coverage IC-R9000 receiver uses 11 separate bandpass filters in the 100KHz to 30MHz range and precise-tuned bandpass filters with low noise GaAsFETs in VHF and upper frequency bands. Exceptionally high sensitivity, intermod immunity and frequency stability in all ranges.

Multi-Function Five Inch CRT. Displays frequencies, modes, memory contents, operator-entered notes and function menus. Features a subdisplay area for printed modes such as RTTY, SITOR and PACKET (external T.U. required).

Spectrum Scope. Indicates all signal activities within a +/-25, 50 or 100KHz range of your tuned frequency. It's ideal for spotting random signals that pass unnoticed with ordinary monitoring receivers.

1000 Multi-Function Memories. Store frequencies, modes, and tuning steps. Includes an editor for moving contents between memories, plus an on-screen notepad for all memory locations.

Eight Scanning Modes. Includes programmable limits, automatic frequency and time-mark storage of scanned signals, full, restricted or mode-selected memory scanning, priority channel watch, voice-sense scanning and scanning a selectable width around your tuned frequency. Absolutely the last word in full spectrum monitoring.

Professional Quality Throughout. The revolutionary IC-R9000 features IF Shift, IF Notch, a fully adjustable noise blanker, and more. The Direct Digital Synthesizer assures the widest dynamic range, lowest noise and rapid scanning. Designed for dependable long-term performance. Backed by a full one-year warranty at any one of ICOM's four North American Service Centers!

ICOM

CORPORATE HEADQUARTERS
ICOM America, Inc., 2380-116th Ave. N.E., Bellevue, WA 98004
Customer Service Hotline (206) 454-7619
CUSTOMER SERVICE CENTERS
18102 Sky Park South, Ste. 52-B, Irvine, CA 92714 /
1777 Phoenix Parkway, Suite 201, Atlanta, GA 30349
ICOM CANADA, A Division of ICOM America, Inc.,
3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

Amateur Television Quarterly
(ATVQ) is published four times per year. Subscriptions are $18 year US, $22 Canada and $35 DX. All mail should be sent to: Amateur Television Quarterly Magazine, 1545 Lee St., Suite 73, Des Plaines, IL 60018. Post Master NOTE: Change of address should be sent to Amateur Television Quarterly Magazine, 1545 Lee St., Suite 73, Des Plaines, IL 60018. Phone 708 298 2269.

For subscription and other inquires reach us at VOICE MAIL 708 298 2269. FAX 708 803 8994 Leave your zip code when making inquiry about subscriptions. ATVQ is available in most Ham Radio stores.

Amateur Television Quarterly is mailed as Second Class Printed Matter, U. S. P. O. permit # 003-353. Principle office of entry, Des Plaines, IL 60018. Additional mailings are made by First class Mail, Third Class single copy and bulk mail permit # 110 , from Des Plaines and additional Post offices.

BACK ISSUES

ATVQ has sold out of every issue published. We have no back issues available. Back issues may be available at some retail ham stores.

REPRINTS

Reprints of ATVQ issues and articles are available from:

ESF COPY SERVICE,
4011 Clearview Dr.
Cedar Falls, IA 50613.
319 266 7040

PUBLISHER: Bill Brown WB8ELK
EDITOR: Henry Ruh KB9FO
STAFF, CONTRIBUTERS:
too numerous to list!

INDEX OF ARTICLES

INDEX TO ADVERTISERS

CALL FOR ARTICLES

Be famous! Write for the best!! Impress your friends! Earn a few bucks! ATVQ is always in need of articles, especially construction projects. Writers can receive compensation in cash or subscription, or publications. Submissions should be type written and drawings on white or blue grid (fade out) paper. We also accept material on disk, 3.5 or 5.25, in most popular word processor programs or ASCII. Word Perfect is preferred. Computer graphics should be in WP 5.1 or 5.0. All files should be IBM, DOS or Windows compatible. Proofs are sent to authors before publication. ATVQ is also producing a series of new books on various areas of ATV (see page 9 this issue). ATVQ invites authors to contribute material for inclusion in our books as well as ATVQ Magazine.

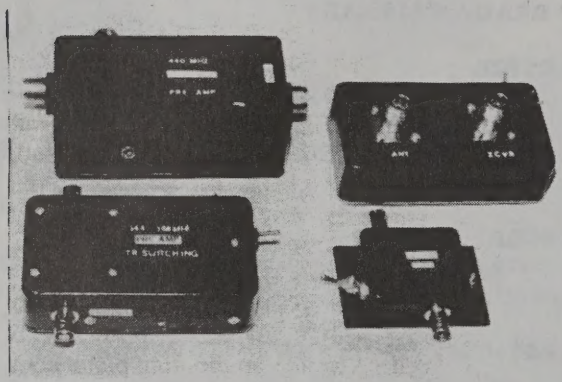
Send material to:
ATVQ, 1545 Lee St., Des Plaines, IL 60018. FAX 708 803 8994.

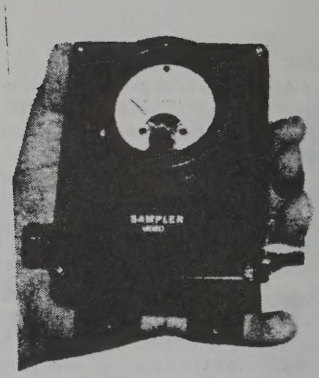
ATV INTERDIGITAL FILTERS

DESCRIPTION

THIS INTERDIGITAL FILTER IS OF THE SEVEN POLE DESIGN. THIS MEANS THERE ARE SEVEN TUNEABLE RODS INSIDE THE BOX. THE FREQUENCY CAN BE ADJUSTED APPROXIMATELY 6 MHz. ADJUSTMENT IS ACCOMPLISHED BY THE ADJUSTING SCREWS AT THE END OF EACH ROD. INSERTION LOSSES OF LESS THAN 1 DB HAVE BEEN OBTAINED WITH THIS DESIGN. OUT OF BAND ATTENUATION WAS >80 dB +/- 12 MHz FROM THE VSB PASSBAND. ATTENUATION AT THE LSB SOUND SUBCARRIER FREQUENCY WAS 30 dB.

VSB FILTERS 439.CH MHZ. $150
910.25 MHZ. $145





PAULDON ATV VIDEO SAMPLER

Model PD-VD-1 $65.00

ATV

VIDEO SAMPLER

This unit picks up your transmitted ATV signal by sampling the transmission line with negligible insertion loss. It uses 2 "N" connectors for input and output connections. A BNC is used on the video output. The detected output is connected to your monitor and scope so that you may accurately adjust your transmitter for proper video & sync levels. We provide two different models. Both have relative power output meters, but one has a greater accuracy. There are 2 PC controls, one for video level and the other for power output. This beats an on the air adjustment.

PREAMPLIFIERS

PD-144E is a 144 to 148Mhz. dual gate low noise preamplifier (0.6 - 0.7db.) with a gain between 18 & 20db. It uses a NEC 41137 or equivalent transistor. It has a tuned input only, using 2 ceramic capacitors. The drain output has a load resistance and a cap. output. This gives a low noise performance. The unit comes with either BNC or SO-239 connectors. Supply voltage should be between 12 and 13.8 volts. It has a 5 volt regulator in the unit and is diode protected. Antenna input is also protected by reverse diodes. ..... $41.00 & $46.00

PD-144TR A T/R switched unit is also available and will handle a max power of 35 Watts. $69.00

PD-144TR-L is a preamplifier which will handle 100 watts through and has diode protection during the relay switching time. Grounded relay contacts are in the unused poles while the preamplifier is in service. The preamplifier is automatically switched out of the circuit when RF is detected during transmission time. Most of the units have a 1 to 1.5 second delay unless you desire fast switching service. It is in a wx resist painted diecast box with installation for a connector down position to help reduce contamination. The box is sealed so that water should not be a problem. SO-239 connectors are normally used, but "N" may be requested. We custom build the mounting bracket and clamp so that it can be either mast or boom mounted. .....
FOR VOLTAGE FEED THRU COAXIAL CABLE OR F/T CAP. CONNECTION $129.00

PD-220E for the 220Mhz. band is the same as PD-144E ..... $39.00 & $44.00

PD-440S 70cm. 426 to 450Mhz. preamplifier is a SINGLE GATE type using either a NEC 2SK-571 or a Mgf 1302 transistor. Noise figure is 0.6db. and has a gain of 16db. or better. It operates from a 12 to 13.8 volt supply, is diode protected and has a 5 volt regulator for stability. The source leads are by-passed with disc capacitors and the input uses a high "Q" piston Trim Pot. The output is not tuned so that the noise figure is consequentially low. A Toroid is used in the output, with capacitor coupling to the output. In this model either BNC or "N" connectors are used. ..... $49.00 & $51.00

PD-440TRL is a tower mounted 70CM. pramplifier whose description is similar to that of the PD-144TR-L except has "N" connectors. .....
FOR VOLTAGE FEED THRU COAXIAL CABLE OR F/T CAP. CONNECTION $129.00

PD-900 is a 902-928Mhz. preamplifier with a noise figure of 0.6 to 0.7db. and a Gain of 14 to 16db. With BNC. $60.00
"N" Connectors 68.00

PD-900TR is a R.F. sensed preamplifier and can be transmitted through with a maximum power of 20 Watts. $119.00

PD-1200 and PO-1200. SAME AS THE PD900) ..... $60-68 & $119.00

PD-2300 is for the frequency range of 1.8-2.4Ghz. $72.00
No T/R Switching Capability.

FOR ADDITIONAL INFORMATION SEE CATALOG

Special Prices on Many Products

WARRANTY IS 1 YEAR ON LABOR AND 6 MONTHS ON PARTS (SEE OUR GUARANTEE FOR THE EXCEPTION). YOU MAY RETURN ANY UNIT WITHIN 30 DAYS IF YOU ARE DISSATISFIED OR IF THE UNIT DOES NOT PERFORM TO YOUR SATISFACTION.

BRICKS: SAU-11 900 MHZ, $19.00; on wired P.C. Boards $25.00
M57762 1.2 Ghz. $72.00; on wired P.C. Boards 99.00
SAU-4 440 Mhz. on wired P.C. Boards 18W. 86.00
M57745 440 Mhz. on wired P.C. Boards 35W. 120.00
SAV-7 144 - 148 Mhz. wired P.C. Boards 35W. 89.00
M57727 2 mtr. Linear wired P.C. Boards 35W. 98.00

POWER AMPLIFIERS:
144 - 148 Mhz. PD-144 N F.M. 35 watt output (2W. in) T/R $109.00
SAME with preamplifier 129.00
PD-144N-1 Linear 35 watt output T/R 125.00
PD-144N-2 F.M. 60 watts (2W. in) T/R 159.00
WITH PREAMPLIFIER $179.00
225 Mhz. PD-220N F.M. 35 Watts output (2W. in) 123.00
426 - 450 Mhz. PD-440N Linear 18 watts output (2W. in) 119.00
PD-440N-1 Linear 35 Watts out (2W. in) 155.00
Same with Preamplifier 173.00

NEW: Linear P.A. (Mini) 100MW. = 1W. & 1W. = 6W. ..... $55.00 - $65.00

ABOVE FOR 70 Cm. Band. LETS YOU GET FULL POWER FROM YOUR LARGE P.A. AS AN IN BETWEEN AMP. PRODUCES GOOD VIDEO & COLOR ON ATV.

902-928 Mhz. PD-900 DOUBLER 70 CM. = 33CM. ..... $45.00 & $85.00
Above ½ W. in ½ W. or 1 W. out.
PD33VLP mini Amplifier (½W. = 1.5W. $49.00
PD-900N F.M. ½W. = 10W. ..... $50.00 or $65.00
Above may be used on ATV with 2 to 3 watts ouput.
PD-33LP 1W. in = 6-7W. output $99.00
PD-33HP 5 W. in = 16W. output 119.00
PD-33LHP 1W. in = 17W. output 210.00
1.2 Ghz. PD-1200N 1W. in = 18W. output ..... $149.00 & $165.00
PD-1200TR 1W. in = 16W. output T/R 195.00
PD-1200N-1 2W. in = 36W. output 285.00
Above P.A. has a P.C. Board Combiner

2 mtr. & 70 CM
DUPLEXED POWER AMPLIFIER: 35W. out on 144-148 Mhz. $225.00
18W. out on 440Mhz.
Input power 2 watts.

DUPLEXERS: 70 CM & 2 Mtr. (100W.) $25.00
Attenuators: (ALL BANDS) R.F. 6.00
ATV SAMPLERS: $45.00 $60.00 $65.00
FM Audio Transmitters & Receivers (Single Frequency)
TRANSMITTERS 1W. output 902-928 Mhz. less xtal $239.00
RECEIVERS FOR 902-928Mhz. less xtal 179.00

KITS FOR 2 METERS, INQUIRE

pauldon ASSOCIATES
210 Utica Street Tonawanda, NY 14150 (716) 692-5451

DAYTON 1992

FRIDAY

ALL ROADS LEAD TO THE HOLIDAY INN NORTH

ANNUAL ATV PARTY

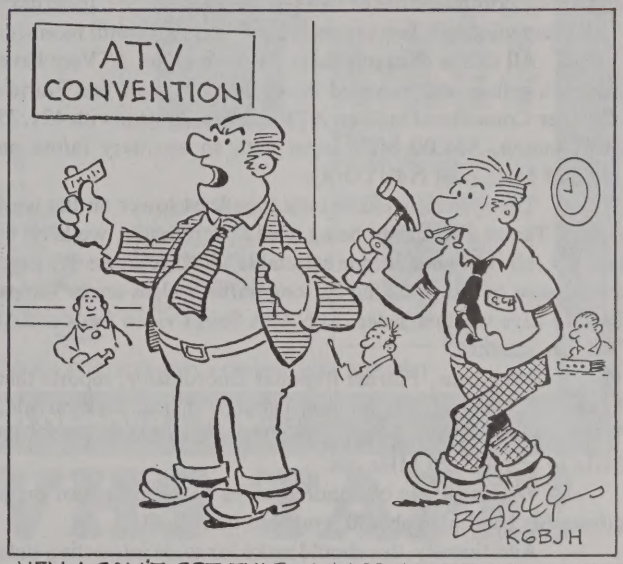
As in past years, ATVQ is sponsoring the annual Friday Night ATV party at the Holiday Inn North, Wagoner Ford Rd at I-75. The symposium will again be in the large, air conditioned main ballroom. The evening activities begin at 7 PM and last usually well past midnight. As in the past, guest speakers will cover a variety of interesting topics starting at 7:30. Free munchies and beverages as usual. (A donation is welcome as we spend $800 or more each year). Last year provided the first public viewing of the STS 37 shuttle video, the first FSTV received in space, presentations on rocket, balloon and kite ATV, how to get on cable TV to promote ham radio/TV and much more. Bill WB8ELK has arranged for an even more exciting program this year.

HOME BREW CONTEST

As usual, ATVQ will give away $100 CASH for the best home brew contest entry. Bring your latest project or photos and a write up if the item is too large to bring. Judging is always by volunteers from the audience! Video recording of the night is encouraged. Bring your handy-lookies for a shootout too!

SSTV

The SSTV get together is in the adjacent section of the Ballroom, sponsored by Don Miller W9NTP.



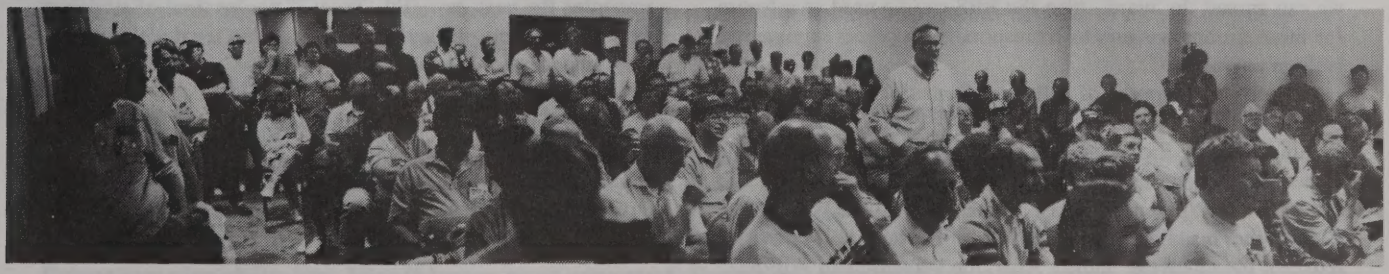
HEY, I CAN'T GET THIS @#★!? STUPID I.D. BADGE OF YOURS TO STICK TO MY JACKET!

SATURDAY

The ATV forum will be held on Saturday April 26th in room 3 from 2:45 to 5:00 PM. The forum moderator will be Tom O'Hara, W6ORG. The program subjects and presenters are:

Getting Started in Amateur Television by Bill Parker W8DMR.
Spectrum Management problems relative to ATV, Tom O'Hara W6ORG,
Balloon rocket and R/C ATV, Bill Brown WB8ELK and Bob Rau N8IYD,
Handie Lookie Shoot Out, an open Show and tell contest.

There is a super prize to be awarded for the winner from PC Electronics!



A portion of the folks attending the Friday night ATVQ ATV get together at Dayton 1991 in spacious air conditioned main ballroom of the Holiday Inn North, Dayton, OH, I-75 at Wagoner road, Also location of the SSTV friday night get together (adjacent room).

ATV NEWS

Tampa Bay (Florida West Coast)

ATV activity on Florida's west coast is finally in high gear! There are 20 to 30 semi-active ATVers in the Tampa Bay area (including Tampa, St. Petersburg, Clearwater and Sarasota).

However, because of the moderately great distances between cities due to the large bay in the middle of everything, and the uncoordinated use of five separate frequencies, there have been disappointingly few successful ATV contacts until recently.

All this is changing now that several are ATVers have gotten together and received co-ordination from the Florida Repeater Council and built an ATV repeater system with 421.25 MHz output, 434.00 MHz input with an auxiliary in/out on 1252.25 MHz (call N4UYO/R).

The system is locate on a broadcast tower on the west side of Tampa. When not being used as a repeater, we hope to add the following touch-tone selectable video sources: 1.) Live surveillance camera watching the long traffic bridges across Tampa Bay, 2) Live weather radar, 3) NASA Select video feeds and 4) Weather satellite.

John Sims, Florida Repeater Coordinator, reports that Miami, Ft. Meyers, Melbourne, Daytona Beach, Jacksonville, Tallahassee and finally Tampa have all been coordinated on 434.00 MHz in and 421.25 MHz out.

With a couple of hundred miles between each of these cities, this band plan should work out quite well.

Additionally, this should make for some interesting state wide round-tables during the seasonal tropo ducting band openings. (TNX to Lloyd Berg N4UYO for the above info.)

Balloon Launch Information now on 73 Magazine BBS

If you would like to check out the latest information on upcoming balloon flights and when they are likely to occur, check out the BALLOON area on the 73 Magazine phone line BBS. Dial up (603) 525-4438 (up to 2400 baud) and select AREA 13 for the latest information. If you or your group is planning a balloon activity, please feel free to leave a message with details so that we can spread the word. Also the BBS can be used as a forum for those groups wishing to correspond with others involved in balloon payloads.

Another source of balloon information can be obtained by listening to the weekly ATV net on 3.871 MHz every Tuesday evening at 8 p.m. Eastern time. Those of you with TVRO satellite dishes can tune into the net by listening to the 6.2 MHz audio subcarrier on Spacenet 3 (S3), transponder 21 (if you have a Videocipher installed, you will have to either turn it off or bypass it to hear the subcarrier audio). Also, Joe Mayenschein WB9SBD has been recently hosting a BACAR net (Balloon Carried Amateur Radio) on 14.255 MHz every Saturday afternoon at 3 p.m. EST.

Earthwinds Delayed till November

The launch of the Earthiwnds manned balloon flight has been delayed until next November. This flight will take three balloonists on a record-breaking non-stop journey around the world, while travelling with the jet stream at 35,000 feet in a pressurized gondola. They almost launched the massive two-balloon system early Saturday morning, February 22, from the Loral Airbase in Akron, Ohio. Unfortunately, the wind speed at ground level never became calm enough to completely assemble and launch the balloon. The 180-foot-tall balloon is capable of lifting over 20,000 pounds and contains over 300,000 cubic feet of helium at liftoff.

Jet stream patterns as well as world-wide weather conditions are not favorable for the flight after the end of February. Therefore, the decision was made to delay the trip until next November when weather conditions give the crew their best chance at a successful circumnavigation of globe.

The pilot of balloon, Larry Newman KB7JGM, will activate the amateur radio experiment during the flight on a frequency of 28.303 MHz. Thanks to the efforts of Bob Rau N8IYD, Jud Nichold N8RXT and Bill Brown WB8ELK, a voice telemetry system was designed to relay the balloon's latitude, longitude and ground speed, based on data obtained from the onboard GPS (Global Positioning Satellite) system. It will transmit at 15, 30, 45 and 55 minutes past each hour during the flight. Special thanks go out to Mike Mouser, Jerry Knight and Loney Duncan of Rockwell International who integrated the telemetry package with the gondola's HF radio and GPS system.

ATV in Great Falls, MT

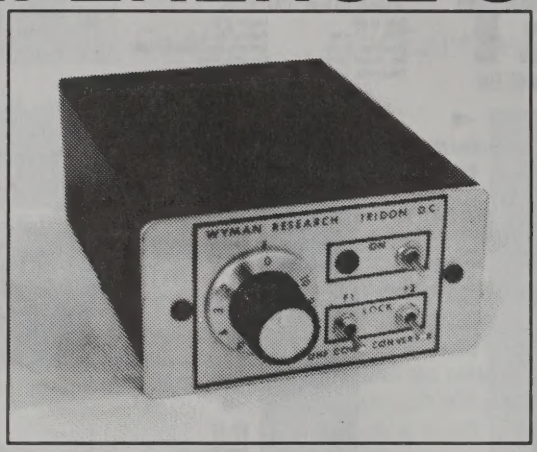
On September 9th Don WB7ETT gave a presentation on ATV at the monthly meeting of the Great Falls Area Amateur Radio Club.

In addition to a talk, Don had two transceivers set up for a "live" demonstration which was impressive. Don stated that several were interested, and one "ham" went shopping for a camcorder the next day. [Ed. Note: If you're tired of staring at a blank TV screen, it may be time to stir up local activity via a club demonstration - you might be surprised at the results].

Ed. Note: The above item first appeared in the July-August-September 1991 issue of the Montana ATV Society newsletter. If you are active in Montana on ATV or would like to know about activity in the region you can write to Darrell Beckstrom K7IUI, Box 5471, Helena MT 59604.

GET RID OF FM REPEATER INTERFERENCE ON ATV

NEW FROM WYMAN RESEARCH



NEW! IMPROVED ATV RECEPTION

The new Wyman Research DC-2 downconverter makes it possible to receive the interference-free lower sideband of ATV transmissions. The unit eliminates the interference from FM repeaters which operate in the ATV upper sideband. The design principles are described in *73* magazine, March 1992. The many features of this new development are:

- High sensitivity GaAsFet front end
- Two stages of RF gain
- Low noise four diode balanced mixer
- Tunes 420–440 MHz, output channel 2, 3, 4
- Beautiful Tridon style matched metal cabinet, 2.2″ x 4.25″ x 5.5″
- Optional *crystal control* circuit for receiving either upper or lower sideband from ATV repeaters.
- Can be custom configured for any frequency combination of tunable lower or upper sideband or crystal control
- Low prices: DC-2 ..... $109.95
  DC-2 with crystal option $174.95
  Shipping $4.50

Wyman Research Inc. has a full line of 450, 900, 1200 MHz FM and AM ATV transmitters, transceivers, receivers and amplifiers. All of our transmitters and transceivers have ON-CARRIER AUDIO for greater range as well as SUB-CARRIER AUDIO. The Tridon transceiver has an optional ON-CARRIER receiver that no other manufacturer supplies. Write or call for a catalog describing equipment that will put you on ATV at minimum cost. Our transmitters and transceivers are the most powerful and economical sold.

JOIN THE BATC
CQ-TV MAG.—$18
VHF-COMM.—$24

WYMAN RESEARCH INC.
RR 1 Box 95
Waldron, IN 46182
(317) 525-6452

Don and Sue Miller
W9NTP W9YL

MAKING CONTACT
144.34

Most ham TV stations monitor 144.34 which is the national ATV voice coordination frequency. This 2 meter frequency is used both for local nets and for DX in combination with the HF frequencies of 3871 KHz. and 7243 KHz. There are local activities on other frequencies throughout the U.S. and Canada where local preference is a different frequency. Here is a listing of those areas and their local ATV voice coordination frequencies. If an area of interest is not listed, assume that 144.34 is the frequency used. The list was generated in ZIP CODE order. For FM Repeater pair frequencies only the output is listed unless the input does not follow ARRL bandplan. Use the city named as an AREA guide. The cities listed come from actual ATV operator letters.

This list should also be handy for DX. Just looking at the variety of frequencies used in even one state, explains why there are no DX reports from some areas. Even if the band is open, the areas are on different frequencies and aren't talking to each other on 2 meters! It is strongly recommended that adjacent groups start working on a mutually agreeable frequency, such as 144.34, so that the various areas can work each other when the band is open!

AREA	State	Freq.
Nepean	Ont	146.43/147.03
London	Ont	145.67
Calgary	Alb	144.8
Penticton	BC	146.49/146.43
Tewksbury	MA	145.29
Holyoak, Greenfield	MA	144.34
Stratford	CT	146.61
Windsor Locks	CT	144.34
Meridian	CT	145.34
Riverside	NJ	147.435
Jamaica, Islip, Deerpark	NY	146.535
Westbury	NY	146.04/64
Amhurst	NY	144.34
Wyoming	PA	146.61
Wapwallopen	PA	146.52
York	PA	146.97/147.47
Pittsburgh	PA	147.03
Chester	PA	147.435
Philadelphia, Prussia	PA	147.435
Gaithersburg	MD	147.00
Abingdon	MD	145.13/147.03
Millersburg	MD	145.13/144.95
Baltimore	MD	144.95
Waynesboro	VA	146.850
Roanoke	VA	145.21
Staunton	VA	146.25/85
Lynchburg	VA	147.375
Ladson	SC	146.55
Jacksonville	FL	146.955/144.34
Miami	FL	145.43
New Port Richey	FL	144.43
Garley	AL	145.33
Huntsville	AL	145.33
Knoxville	TN	146.625
State of OH 430.25	OH	147.45/144.34Reynoldsburg
Indianapolis	IN	147.39/144.34
Owatonna	MN	147.105
Minneapolis, Mankato	MN	147.57
Harwood	ND	146.67
Bozeman	MT	146.43
Chicago	IL	144.34/146.73
St. Louis	MO	144.38
Belton, Kansas City	MO	147.12
Onaga	KS	146.67
Pittsburg	KS	146.46
Wellington	KS	146.64
Kenner	LA	145.47
Bentonville	AR	146.46/144.34
Tyler	TX	145.45
Quinlan	TX	146.76
Boise	ID	145.25
Sun City	AZ	147.28
Phoenix	AZ	145.17
Las Vegas, Boulder	NV	146.43
Los Angeles area	CA	146.43
Buellton	CA	146.43
Visalia	CA	146.88
Hayward/Black Mt. rpt	CA	145.51
Hayward/Mt. Diablo rpt	CA	147.060
Kelseyville	CA	146.675
Pahoa	HI	144.170 SSB
Portland	OR	146.43
Seattle, Kent	WA	146.42

Letter to the Editor: *Comments concerning Bill Pasternak's (Westlink) letter in the January (winter) 1992 issue.*

Congratulations on another fine issue of ATVQ. I read with great interest the offering of The Amateur Radio Newsline, Inc. (ATVQ WINTER 1992 PG 16-17) And felt compelled to respond.

Mr. Pasternak has outlined in some detail why he became disillusioned with ATV in "Hollywierd". To him I say; **"PHYSICIAN...HEAL THYSELF !"**

I suppose you could tune into to many conversations nowadays about what's wrong with the amateur radio service, and I usually note that the loudest critics are collectively the most apathetic lethargic group of individuals in the service. In my opinion, anyone who is active in ATV is making a positive contribution. Technical articles, slides of Borneo, videos of the family, video ragchew, pets, trains and automobiles all have their place.

I think those of us who are active in ATV should help encourage everyone to become active with whatever their level of programming skill. If a station cannot find/afford a color camera should we mock him, scorn him, indeed blame him for the demise of ATV. I think not. Rather we should embrace the newcomer as the future of ATV.

Perhaps Mr. Pasternak is confused about the frequencies we operate on. Our band is below the broadcast band, although there are those who would like to turn amateur television indeed amateur radio into a professional broadcast medium.

Mr. Pasternak refers to ATV in California as "Crapola." I find that hard to believe. My experience with the California ATV'rs is that they are a spirited, involved and dedicated group. I think the only "crapola" I've seen is Pasternak's 8 point plan to improve ATV. Not once did he mention the primary objective of amateur radio. We are all striving to integrate ATV into community service first, and second to communicate with each other visually. His goal is to broadcast...to whom? He first wants to alienate the average guy, Then he wants that same guy to sit down and watch a regular news review "ala his audio newsline." This appears to be a self serving, narrow minded, and incompetent proposal.

Long live technocrats, slides of Borneo, and Coors beer...and short life to the likes of people who would have our amateur television service turned into a broadcast network! John P. Spaeth, KDØLO, ATV Repeater, St. Louis, Missouri.

[Ed. note] ATVQ invites reader comments. Published letters represent the opinions of the writer and are published unchanged and uncensored. Submissions should be addressed to: Editor, ATVQ, 1545 Lee St., Des Plaines, IL 60018.

NEW PUBLICATIONS FROM ATVQ

ATV SECRETS VOLUME II

Finishing touches were being added to our latest ATV SECRETS book which is being completed at the same time this issue was being completed. Makes for a busy editor! ATV SECRETS Vol. II is a technical handbook of ATV and video information and includes both previously un-published material, and selected construction and theory articles from past issues of ATVQ. Topics include, RF and video filters, down-converters and preamps, power amplifiers, transmitters, FM Video, special effects, station studio and operations, Antennas and much more. Highly illustrated with lots of charts, diagrams and a good selection of hard core technical topics. $25 post paid. Street date is expected to be late April, hopefully in time for Dayton 92.

The Complete Book of:

A series of short books, each devoted to a single topic. These are collections of articles from ATVQ on a particular subject. Price will be announced after we know printing costs. Watch for these at Dayton and a complete write-up next issue. All books are printed on the same high quality paper used for ATVQ, not photocopies or newsprint.

VOYAGE BACK IN TIME

Join the valiant crew of the United Federation fleet in Forward IO of the Order of the Iron Test Pattern. Sip down your favorite Tiberian Brandy or other elixir or libation of delight in your very own LIMITED EDITION, ATVQ 12 oz. ceramic mug with a genuine original Indian Head test pattern on one side and the ATVQ logo on the other. Both logo and TP are in dark brown (TV black) on an antique light tan ceramic. Our only mention of these collectors mugs was in the last issue of ATVQ. They arrived March 6th and we shipped out over 100 the first day. $9.95 plus post/ups ($2.90 US postage, 1 lb 4 oz shipping weight) These were heavier than I originally thought! And after a few 807's maybe you will want more for friends! Great gift for the video hobbyist!

TEST PATTERNS

Old subscribers will recall we published a set of 4 test patterns a couple years ago. We have about 50 copies left. The high quality glossy 4 side sheet contains a standard convergence ball chart, a gray scale chart (not a true reflectance chart) optical color bars, and a standard resolution chart. These are handy to verify camera operation or use for ID charts (add your call letters) or good wall decorations! Each is 8.5 x 11. $5 each post paid.

ORDER FORM:

_____	ATV SECRETS Volume I @ $9.95 + postage ($1.50 US, $2. Canada)	_____
_____	ATV SECRETS Volume II @ 24.95 + postage ($2.90 US, $4. Canada)	_____
_____	ATVQ/Test Pattern Mugs @ $9.95 + postage ($2.90 US, $3.70 Canada)	_____
_____	Test Chart set $5. Post paid	_____
_____	BATC, Slow Scan Companion Book @ 11.25 post paid	_____
_____	BATC, ATV Compendium @ 11.25 post paid	_____
_____	BATC, Micro and Video Projects, @11.25 post paid	_____
_____	Subscription: BATC, CQ-TV @ $21/yr _____ years	_____
_____	Subscription: VHF Communications @ $27/yr _____ years	_____
_____	8 Page ATV is Fun and Inexpensive @ 5/$1 (with any other book order)	_____
	(add postage $1.25 for the first 40 copies, .50 each additional 40 copies)	
	TOTAL:	_____

NAME: _____ **CALL:** _____

STREET: _____

CITY: _____ **STATE:** _____ **ZIP:** _____

PHONE: _____ **VISA/MC #** _____ **EXP:** _____

Coming soon: The Complete Book of: RF and Video Filters; ... Video Projects; ... Transmitters and amplifiers; ...Receivers and preamps; ...FM ATV; ...ATV Antennas; ... ATV Repeaters and Computer controllers.

ATV at the Ronald Reagan Presidential Library

by Bob Raynor W6LUY

Friday afternoon at work, I received a phone call from my wife. Alan KA6WGO had called; we had an invitation to assist with the Ronald Reagan Presidential Library opening.

Rick's camera position was located next to the RV and the command post.

Rick N6ZT shooting video of the activities.

The Ventura County Sheriff's Department had seen some previous work we had done with them, using Amateur Television, and requested our assistance. The Sheriff's department had the assignment of crowd control for the area around the Presidential library and wanted video from a helicopter to be fed directly to their command center. It was an honor for us, members of the ATV Supper Club, to be called; Rick Nimms N6ZT; Ron Poulson WB6FXW; and myself (Bob Raynor W6LUY). We all had many experiences in the past years using ATV in many parades, bicycle races, shows, yacht races, and flights using a Cessna 182. Each time we engineered an invitation or set it up for ourselves but this time someone else asked for our help!

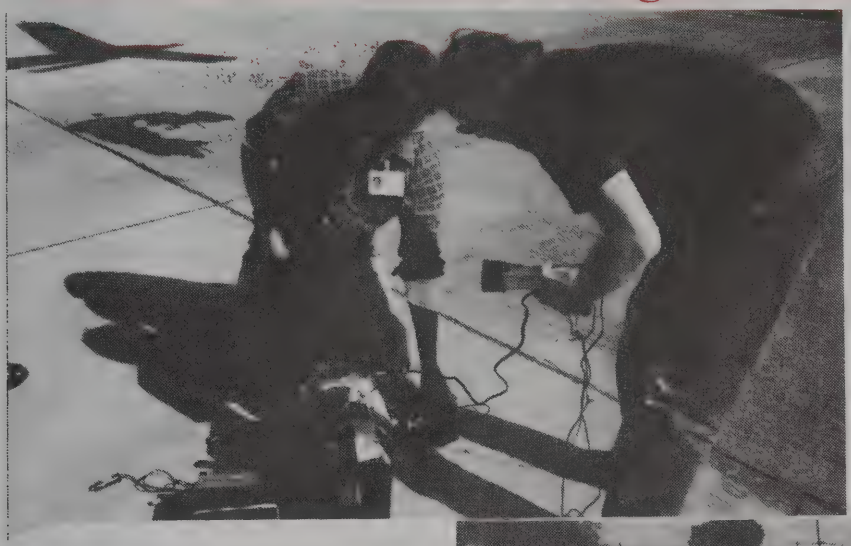
We met at the airport on Saturday morning to survey the helicopter and how we would put this together. The Sheriff's mechanic, Hector, was a great help. He tried one of our antenna ideas, and then another, until we decided on a ground plane vertical that Rick N6ZT had on the bottom of the helicopter step. Ron and Rick quickly packed the equipment we had in a package with liberal use of duct tape. We used a PC Electronics TC70-1 and a Mirage D24N amplifier. For power, we used a deep cycle RV battery. For audio, Ron used an ICOM 2AT and a rubber duck antenna. Bob Boles, the Sheriff's video technician, was not too sure of our installation, but we assured him it would look better on Monday. We had a practice flight an hour later. Ron WB6FXW had his feet wrapped around the equipment but it worked! In the meantime, Rick and I had to drive to the Presidential Library and install the receiving equipment. We installed a vertical on a 15-foot mast and taped it to the command center, a modified motor home. The video was fed to two TV sets, one with a video recorder. Using a PC Electronics TVC4 downconverter and a passive splitter, the signal was P-5. It was Saturday at 2 p.m. and we had finished the first step. Everyone was in my garage on Sunday afternoon. Ron building cables and putting new plugs on the ends. Rick, packaging the transmitter and gathering the equipment we would need for the receiver. I had added a 12-volt DC fan to the Mirage amplifier. We had used the fan before on long transmissions to keep the amplifier cool.

After a very early breakfast and rendezvous at the East Valley Sheriff's station in Simi Valley we were on our way. We arrived at our site at the Presidential library at 6 a.m. My RV was parked alongside of the Command Post giving us a clear view of the flight of the helicopter and also a clear shot to the Oat Mountain ATV repeater overlooking the San Fernando Valley. Ted Gradeulak W6TOQ was also taping our video and would be a buffer to warn away any interfering stations. We were ready!

About 9 a.m., before the arrival of the dignitaries, the helicopter went up with Ron and his ATV station transmitting. They went around the area twice to check for any crowd problems; the video was great! The Presidents arrived, and everything was quiet. The helicopter went up again at 11 a.m. with still more P5 video with great color. The ceremonies started without incident.

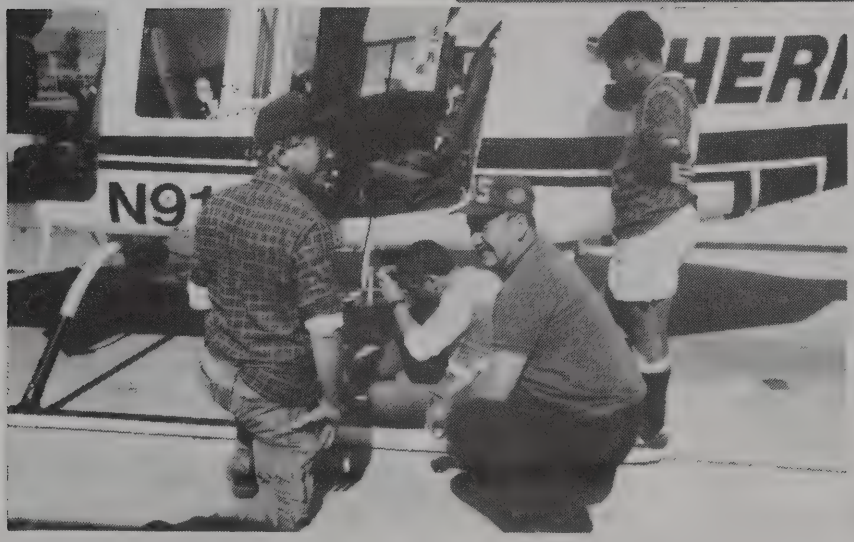
While things were quiet, we shot pictures of the area back to Ted and the viewers of the ATV repeaters. Ted said he heard comments that we were bringing up three ATV repeaters and a lot of ATVers were watching. We were sorry we couldn't announce the event in advance to the ATV gang since we were asked to keep the operation confidential. Thanks to the Ventura Sheriff's Department, the helicopter pilots and all those who helped in this event. Special thanks go out to Bob boles who assisted us with great camera work.

ATV at the Ronald Reagan Presidential Library



Rick N6ZT and Ron WB6FXW check out the equipment prior to loading it into the Sheriff's helicopter.

Ron WB6FXW and Rick N6ZT begin installation process.



Ron WB6FXW, Bob W6LUY and Hector (the mechanic) install the ATV antenna on the helicopter. Rick N6ZT shooting video of the activities.

NEW! From Micro Computer Concepts

VS-100 ATV REPEATER CONTROLLER

Remote Video Switcher

- Repeat, Scan, and Manual Modes
- 10 Video and 4 Audio Inputs
- Touch Tone Controlled
- Video ID Input/ELK Board Support
- ATV and Audio Repeat Control
- Features for ATV Use
- Space and Power for Ad-on's
- 19" w x 1.75" h x 10" d Enclosure

VS-100 Wired & Tested w/Manual . . . **$ 399.95**
Manual . . . . . **$ 9.95**
Phone Line Interface . . . . . **$ 99.95**

VISA MasterCard

Micro Computer Concepts
7869 Rustic Woods Drive • Dayton, OH 45424

513-233-9675

GOOD AMATEUR PRACTICE

Frequency coordination and band planning and spectrum management are the same job!

ANOTHER 440 BANDPLAN THREATENS ATV REPEATERS

The Mid America Coordination Council represents the frequency coordination councils of about 25 states and is by far the largest organization of its type. It has representatives from nearly all midwest and near west states and has been a sound organization for years.

On February 3rd, it announced a proposed bandplan sponsored by the Indiana Repeater Council for the 420-450 MHz. band. The plan is reproduced here. The question it raises which will be answered by MACC is where to put ATV repeaters.

A LITTLE HISTORY

Once upon a time there were no ATV repeaters. Then along came WR4AAG and Bruce Brown WB4YTU, Metrovison of the Washington, D.C. area. In 1974 Bruce successfully obtained a special temporary authority (STA) to operate an in-band ATV repeater on 439.25/421.25. At the time the repeater rules, 97.61(c) allowed repeaters only on 440-450 MHz. And as we know the rest is history. Also 439.25 has been the traditional ATV frequency ever since the weak signal and ATV operators split apart with weak signal staying on 432.1 and ATV moving to 439.25. This was long before FM and FM repeaters. Now be mindful that when we say atv is on 439.25, we mean the video carrier. The ATV signal has sound at 443.75 and in between are video sidebands. Also the sound is 25 KHz. deviation not 5 KHz. With that in mind, we move ahead.

In 1977, the FCC extended the waiver for ATV repeaters for 5 more years or until docket 20777 was decided. Docket 20777 was the "bandwidth" docket which was to change the operating nomenclature and limitations of emission from the former system of signal designator (A3, F3, A5) to bandwidth limitations. Unfortunately it also proposed to eliminate ATV which was never requested, but that's another political story. The proposal was soundly defeated and 20777 became vacant. In 1978, docket 21033 was adopted which essentially allowed repeaters on any frequency except weak signal (431-433) and Oscar (space communications) sub-band of 435-438 MHz (97.63(b). Thus became the allowance for all ATV repeaters in operation today.

A few years ago, there was another rule making which set the FCC to the side in band planning. The rule making concentrated on repeater coordination. But, within the framework of the repeater coordination is also contained some key phrases. One is, "Local options shall supersede the national bandplan" and "coordination of users shall be deemed good amateur practice."

The first phrase indicates, according to Chris Imlay, ARRL counsel, that although the ARRL has a national band plan, local coordinators may vary from the plan in favor of local options. This explains the operation of ATV on 434.00 MHz. in southern California and a few other areas. The second phrase is the empowerment of the local option. Frequency use which has been coordinated locally in variance with the national plan is accepted by the FCC as <u>good amateur practice</u> and supersedes the national band plan except the prohibition for repeaters in the weak signal and Oscar subbands. It has been long recognized that the ARRL national band plan for 420-450 MHz was poorly conceived and is rift with technical errors and built in interference problems.

Now on to the good part. It is no secret that FM repeaters have been encroaching into the ATV passband of 438-444 MHz. Just a scan of the ARRL repeater listing book will confirm that. ATV operators in most areas already know this all too well. There is also a move to put packet in the 440-442 and 438-440 MHz. portion of the band. This causes severe interference. It can be done on some frequencies with low power (1 watt) and directional antennas of opposite polarity to minimize interference to other band users, as is done in LA.

THE INDIANA PLAN

The Indiana plan asks for ATV frequencies based upon the Indianapolis ATV repeater. It is not necessarily a typical repeater in that they use 425.25 for transmit and 439.25 VLSB for receive.

Lower sideband operation has been proposed by Don Miller W9NTP of Wyman Research (a marketer of VLSB receive converters) which is not compatible with the AEA ATV transceiver which is VUSB only. Most other ATV equipment, and the majority used by ATV'ers are DSB. Any exciter made by any manufacturer will become DSB as soon as you add an amateur amplifier of any kind because of amplifier intermod products. This has been extensively written about in the pages of ATVQ. VSB operation is only going to happen if you have a VSB filter after the last RF stage of your transmitter no matter what equipment you use. AEA offers a low IM ATV amplifier but any transmitter operated in repeater use or below 425 MHz. should have a VSB filter in the RF line to reduce undesired or out of band products.

The use of VLSB on 439.25 in simplex or repeater mode does eliminate most of the interference from FM mode signals since few FM mode stations operate below 440 MHz., although the newer transceivers are now offering coverage to 438 MHz and a few all mode units tune to 430 MHz.

439.25 VLSB OR 434.00 VUSB?

The question is whether 439.25 VLSB is better or worse than 434.00 VUSB. Lets examine the signals. The 439.25 input ATV repeater still has its users operating in DSB mode, since there is no requirement for the user to use or VLSB, it is unlikely that the user will invest $150 in a filter for elimination of the upper vestigial sideband, and any amplifier will generate both sidebands as intermod products and few would operate with only 1 watt output. The USB still poses a <u>potential</u> signal source in the FM repeater band. Because of the nearly universal use of high gain highly directional antennas the <u>probability</u> of signal intercept is nil.

Meanwhile, the proposed new wind radar on 449 MHz will likely cause many of the FM repeaters which operate high in, low out to change to low in, high out. This will place more and more carriers (all the users vs only the repeater output) within the passband of an ATV receiver tuned to 439.25 VUSB, or the vestigial portion of the 439.25 VLSB signal. Remember there is at least 1.25 MHz, to 1.5 MHz. passband above the carrier in VLSB TV operation. It is not SSB but VSB There is a <u>vestige</u> or portion of the upperside band still remaining which is necessary for proper video response of the luminance signal to 1.5 MHz.

GOOD AMATEUR PRACTICE

Operation at 434.00 using VUSB does not have the potential conflict with FM repeaters in the passband since the pass band ends just above 438.5, the sound sub-carrier frequency. The color sub-carrier is not present (NTSC uses a suppressed carrier color signal) but there is energy -32 dBc from the color sidebands at 437.58.

It has been demonstrated many times in experimental fly-bys of OSCAR receivers in ATV active areas that there is essentially zero interference potential, especially since the OSCAR antennas generally will be above the horizon and the ATV signals are usually at the horizon. The use in both cases of high gain directional antennas again reduce the opportunity for intercept to a very low incidence. Generally only if the two station are very close and happen to be pointing at each other. This has been the case in the most densely populated region of the US ham radio spectrum, southern California where ATV (and 9 ATV repeaters) happily co-exist with the OSCAR and weak signal users.

Therefore, a user on 434.00 simplex or as a repeater input poses the least mutual interference conditions under our current band usage.

Users of 434.00 who employ reduced lower sideband be it via a filter, phased modulation or SAW filters should happily co-exist and it does not require modifications to operate VLSB which may also introduce problems of image reception as the image of IF conversion for ATV for VLSB operation falls in the commercial UHF TV broadcast band!

So ATVQ suggests to the Indiana Repeater Council and MACC, that ATV repeaters have an input of 434.00 MHz VUSB as the alternative to future congestion and a benefit to all band users. I am sure that some activity will remain on 439.25 as well.

The in-band repeater output should be at 421.25 VUSB to allow for same site operation, where filters and di-plexers will allow use of a common site. Closer operation is not possible due to the physics of filter response. Other users can use the spectrum of 426.00 to 431.00 for links and other purposes. This leaves 438.8-440 for Packet and other digital signals and leaves all of 440-450 for the FM repeaters to fight it out among themselves.

The key ingredient is the LOCAL option which allows coordination of ATV repeaters on 434.00 or as LOCALLY determined. The second is good spectrum management which must consider ALL users, not just FM or repeater users. Something which has been lacking in many state repeater councils.

THE INDIANA/MACC PROPOSED PLAN

420- 432. Experimental and ATV
432- 432.1 EME
432.1- 432.3 SSB
432.3- 434.4 Beacons
432.4- 432.975 mixed weak signal
433.000- 433.150 Links, Auxiliary
433.175- 433.625 Digital, duplex high speed network
433.675- 433.800 links, control, auxiliary
433.825-435.000 weak signal experimental
435- 438 satellite
438.000-444.000 ATV (439.25 MHz. video input required)
442- 444.975 FM repeater outputs
445-445.150 simplex digital
445.175-445-625 digital duplex high speed network
445.675-446.975 links, control, auxiliary
447.000-449.975 FM repeater inputs.

THE ATVQ SUGGESTED BANDPLAN

420-426. ATV repeater outputs VUSB (video at 421.25)
426-431.000 experimental and digital, links, control and auxiliary or 3 MHz. split repeaters.
431-433. weak signal, ssb, eme, beacons.
433-438.5 ATV repeater inputs (video at 434.00, VUSB)
435-438 satellite, antennas must have elevation control no operation below 10 degrees above horizon.
438.00-438.8 low power point to point simplex links (not over 1 watt, with directional antennas)
438.825-440 digital
440-450 FM mode repeaters and simplex (low in high out)

*operation at 439.25 video carrier for simplex ATV and at local option for ATV repeater inputs with mutually accepted interference to/from other users. (use of either upper or lower sideband or DSB)

*An alternate input for cross band ATV repeaters should be 426.25 (video carrier) (425-431) VUSB for input to 33 cm, 23 cm and higher ATV repeater outputs.

Send comments to the MACC VIA John Gebuhr WB0CMC (402-553-5296) and Steve Riley KD9QB, author of the Indiana plan who is suggesting that MACC adopt it as a standard band plan, and your state frequency coordinator.

Readers who would like more information about the technical aspects of vestigial sideband signals should refer to another article in this issue, "Truth about VSB Transmissions."

PARAPLANE ULTRALIGHT ATV

by Fred Merker K3TAZ

About two months ago I found out that there was a member of the Carroll Country Radio Club that had an ultralight aircraft. I wondered if he would be interested in flying with some sort of ATV package aboard his airplane.

Mark N3JLP and John N3JRE prepare to fly Ultralight ATV.

When John N3JRE and I met on the air I asked if he would be interested in some ATV tests. John was definitely interested. So the project was on. I decided to keep this project on the simple side until we had at least one flight under our belts.

My ATV package uses a P.C. Electronics transmitter and an old black and white tube type camera. The camera was originally designed to operate on 110 VAC. I modified it to run on 12 volts. Of course it is a current hog. The camera draws about 300 ma. at 12 volts. So together with the transmitter the system draws more than 500 ma. To limit size and weight I am using AA alkaline batteries.

This current level really limits battery life. In an effort at simplicity and to keep current drain to a minimum I chose to use an optical method for identification. With a wide angle lens and the focus point set to infinity an object at about 2 feet is just in focus. So I used a transparent piece of Plexiglas about 2x6 inches in size. Adhesive letters were used to spell out my call letters. The Plexiglas was mounted on the end of a 2 foot long wooden dowel. The call letters were adjusted to appear just at the bottom of the raster, so that the I.D. would block a minimum of the cameras' view.

On November 2nd we finally had our first ultralight ATV flight. Originally we had planned on an afternoon flight from a field close to my home in the Finksburg area of Maryland. Changing weather conditions and the prospect of high winds in the afternoon caused a shift in time and location. Take off was from a field in Worthington Valley, which is about 14 miles from my home.

John N3JRE was the pilot of the ultralight. Mark N3JLP and I served as ground crew. A lot of discussion went into where to put the antenna and how to make the camera/transmitter convenient for John to handle. Once all of these decisions were make and the wind was acting just right John went for his take off. The flight lasted for about 20 to 30 minutes. I took still photographs and Mark taped the flight. My wife, Dotty N3HDG, was able to see some video back home in Finksburg using the high gain vertically polarized antenna. This only occurred after I placed the dipole antenna in the vertical plane. My intention had been to record the signal using a VCR tuned to cable channel 60.

To keep things simple for myself I planned to use the horizontally polarized antenna that is used for broadcast TV reception. If the flight had been closer to home I think I would have been able to record some nice pictures. However due to the 14 miles distance the VCR did not record anything but noise. So the off the air video tape was a loss. We are making plans for other flights. I plan to order a CCD black and white camera that draws only about 85 ma. This will extend the life of the batteries. John is hoping to do some flights over club members homes.

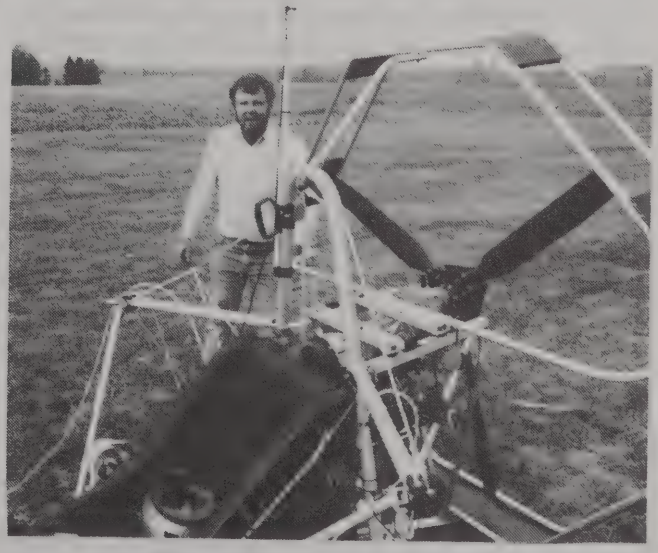
Hopefully this will get more of the members of the Carroll County Radio Club interested in the vision part of Amateur Radio.

PARAPLANE ULTRALIGHT ATV

John N3JRE holds the miniature ATV package just prior to takeoff.

The Ultralight ATV mobile takes off!

Takeoff of the Ultralight ATV mobile station with John N3JRE at the controls. The paraplane only takes a few hundred feet to takeoff.



Close-up view of the PVC antenna mount attached to the ultralight. John N3JRE in the background.

ATV in Ottawa, Canada

Bill Westbrook VE3EKA

The television repeater committee of the Pioneer Amateur Radio Club, Ottawa, has received authorization to place a fast scan television transmitter in the amateur 33 cm band. The transmitter, part of a community repeater, is being designed to use F5 emissions and will have a maximum occupied bandwidth of 10 MHz. This mode of emissions and bandwidth was not previously permitted in the Amateur 902 to 928 MHz allocation.

Background

The Pioneer Amateur Radio Club (PARC) is a voluntary group of amateurs affiliated with the Telephone Pioneers of America. Formed in 1951, the club seeks to further its members' technical knowledge and provide service to the local community at large. PARC meets monthly except July and August and provides its members a regular technical and social forum, publishes a newsletter, sponsors two local FM voice repeaters (VHF and UHF), and provides communication at a variety of public service events each year. Last year a fast scan television committee was formed with the purpose of promoting this exciting form of communication in the National Capital area. Through its efforts eight stations are now on the air and many more are interested. The club also sponsors an Amateur TeleVision (ATV) net which meets each Wednesday at 20:00 hrs, coordinated through the club FM voice repeater VE3TEL. As activity and interest grew, it became clear that a repeater would be a significant contributor to fostering the public service aspects of our group. A repeater allows many to share and participate simultaneously. Currently, because of the wide band nature of ATV, all communications are conducted using highly directional beam antennas. This restricts the number of receiving stations to those directly in the path of the transmitting station. With a repeater using an omni-directional antenna, all amateurs in the area will be able to simultaneously view a transmitting station. Proposed activities include TV experimentation, telecasts of club meetings to shut-ins, live telecasts of public service events, and "visits" with the North Pole at Christmas time. PARC fully supports the establishment of a video repeater, and to this end has established a video repeater committee to see the project through to completion. The repeater facility will be open to all amateurs in the National Capital region.

Rationale for 33 CM FM Transmitter Operation

33 cm FM was chosen after examining repeater configurations in North America and Europe for best coverage, signal quality, technical feasibility, and cost.

An in-band 70 cm repeater is not possible in Canada. Removal of the 420 to 430 MHz segment of this band, and sub-band allocations limit ATV use to one channel at 439.25 MHz. This frequency is being used as the simplex channel in the Ottawa area. A split band repeater, using an output on 33 cm and an input on 70 or 24 cm is considered best. Using this cross band configuration, a station can transmit to the repeater while simultaneously watching the transmission on the repeater output. This allows greater flexibility when adjusting equipment. The Ottawa repeater would use a 70 cm Vestigial Side Band (VSB) input initially, as all amateurs now transmitting TV are using this band. As repeater use increases, an FM input on 24 cm would be established. The 24 cm FM input would eventually replace the 70 cm VSB input as standard for the repeater, leaving the 70 cm band exclusively for simplex use. In this manner, all amateurs now transmitting TV will have low cost access, needing only a low cost receiver to access the repeater. In the future, by adding a 24 cm FM transmitter to their stations, amateurs can use a high quality all FM repeater and still maintain the full duplex feature provided by a split band repeater configuration. In addition to the split band feature, a 33 cm output offers lower path loss than 24 cm (higher power 24 cm transmitting equipment is more readily available at lower cost than 33 cm equipment).

A 70 cm 24 cm split band repeater is also possible. However, this configuration would preclude simplex operation on the 70 cm band. An in band 24 cm repeater is possible, but technically less desirable. It is much more difficult and expensive to construct as it requires relatively wide band isolation filtering between transmitter and receiver, or split site operation.

The 33 cm transmitter will be frequency modulated using medium deviation. Frequency Modulated TeleVision (FMTV) is used almost exclusively throughout the amateur community in Europe and is gaining popularity in North America. It eliminates some of the shortcomings of AM, including the following:

* Allows the use of transmitters having low linearity
* Eliminates sound subcarrier distortion experienced as a result of linearity compression at sync tips
* S/N ratio is improved marginally over AM.

The repeater transmitter would use a Modulation Index (MI) of 0.75. By using this medium deviation, the bandwidth can be restricted to less than 10 MHz, effectively equivalent to a Double Sideband Amplitude Modulated (DSBAM) transmission. This also provides a 3 dB S/N improvement over AM. For fractional modulation indices Carson's rule approximation does not provide an accurate indication of bandwidth. In this range, Bessel functions should be used to determine sideband power, and thus occupied bandwidth.

Repeater Transmitter Specifications

The following is a summary of the proposed repeater transmitter characteristics:

Transmitter callsign	VE3TVA (if located in Ontario)
Transmitter location	Ottawa service region
Emission type	Fast Scan Television (NTSC format)
Carrier Frequency	914.00 MHz
Mode of emission	Frequency Modulated (F5)

ATV in Ottawa

Modulation Index	0.75
Occupied Bandwidth	<10 MHz
Transmitter Power	less than 1000 W
Antenna	Omni-directional 6 to 10 dB gain
Antenna polarization	horizontal

Repeater Receiver Specifications

70 cm Receiver

Receive frequency	439.25 MHz
Receive mode	Vestigial Side Band AM
Bandwidth	<6.0 MHz

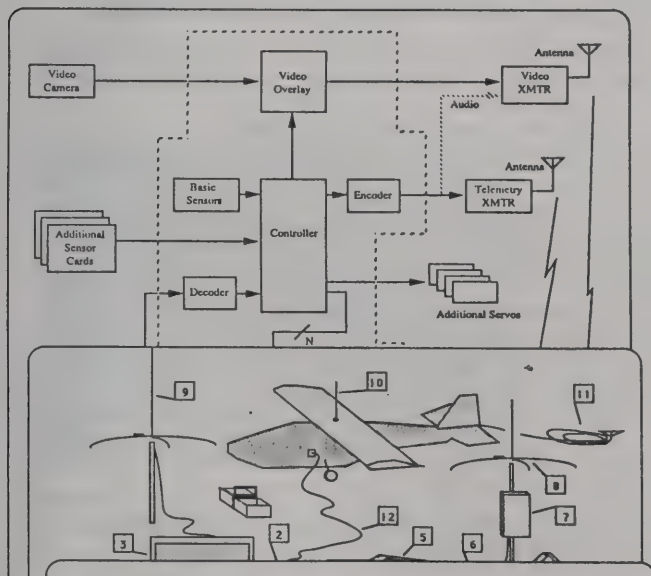
23 cm Receiver

Receive frequency	1285.0 MHz
Receive mode	Frequency Modulated
Bandwidth	<10 MHz

The repeater frequencies, modes of emission and bandwidths for the transmitter and receiver have been coordinated with the local Repeater Council.

Repeater Antenna Selection

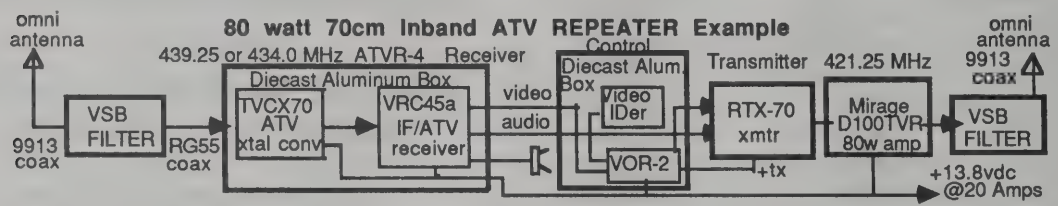
Sinclabs 70 cm SV44OH-6
Lindsay 33 cm modified LPRT/MATV 4SZZsq
Lindsay 23 cm modified LPRT/MATV 4SZZsq



P.C. ELECTRONICS 2522 PAXSON LANE ARCADIA CA 91007-8537 USA
TOM (W6ORG) & MARYANN (WB6YSS) O'HARA (818)447-4565
24 hr **FAX** order line (818) 447-0489

ELECTRONICS

READY FOR AN ATV REPEATER OR LINK IN YOUR AREA?
WE HAVE THE MODULES AND SOURCES FOR INBAND OR CROSSBAND



Select an ATVR Receiver and a RTX Transmitter for the bands you want, add the appropriate linear amp,VSB filters & antennas, ID & VOR-2, power supply and coax for your own repeater. We suggest low in / high out for crossband. Ask for a copy of our ATV Repeater article before you start, to do it right the first time, and also listed are recommended sources of filters, antennas, IDers, etc. Most can put together a good working ATV repeater for under $2000.

TRANSMITTERS ready to go in a 7.3x4.7x2 die cast aluminum box for tight RF shielding. >1 Watt p.e.p. output for proper drive to companion amplifiers. Adjustable sync stretcher to enable set up of the right video to sync ratio after an amplifier is added. Independent mic and line audio inputs. Requires 13.8 Vdc at 500 ma.

RTX-70 specify repeater or link output frequency, 421.25 MHz most popular for inband output.....**$299**
MIRAGE D100ATV-R 90 Watts p.e.p on ATV continuous duty 70cm repeater amp.....**$499**
RTX-33 specify frequency - 923.25 MHz is the most used crossband repeater or link frequency.....**$329**
RTX-23 specify frequency - 1253.25 MHz best first repeater output crossband freq., then 1277.25 MHz.....**$329**
We suggest Downeast Microwave for 900 and 1200 MHz repeater amps to match our transmitters.

RECEIVERS ready to go in a 7.3x4.7x2 die cast aluminum box for tight RF shielding. Contains a TVCX crystal downconverter and VRC-45 receiver. Two composite video outputs, squelched speaker and line audio outputs. Requires 13.8 Vdc at 300 ma.

ATVR-4 specify frequency - 439.25 or 434.0 most popular for inband or crossband.....**$299**
ATVR-9 specify frequency - 910.25 most popular, 923.25 also available.....**$309**
ATVR-12 specify frequency - 1253.25 link, 1277.25 or 1289.25 rpt input.....**$329**

VOR-2a Video Operated Relay board...$45, keys RTX upon detection of horizontal sync plus 10 min. & end of transmission momentary relay for switching to video ID to meet FCC regs. See review in July 91 73 Magazine page 26.
LMB CAB 247 7.3x4.7x2 die cast aluminum box. Great for housing VOR-2a and video ID boards...**$20**

DOWNCONVERTER DISCOUNT of 10% is available to Repeater groups and clubs if you order 5 or more per item of the downconverters below. The order must be sold and shipped to one person at one time. It helps to have some extras available for new people to try out your repeater or use at demos at other clubs and schools. All downconverters have a GaAsfet preamp and mixer for low noise and high dynamic range. Get a board if you want to package your own. You will need a shielded cabinet with knob, switch, connectors and 11 to 14 Vdc power supply. Or get one ready to go.

TVC-2G tunes 420-450 MHz down to TV ch 2, 3 or 4. Wired and tested board, put in your own cabinet..**$49**
TVC-4G ready to go in a cabinet with AC to 12V wall plug supply - contains TVC-2G.....**$89**

TVC-9 tunes 902-928 MHz down to TV ch 2, 3 or 4. Wired and tested board, put in your own cabinet...**$59**
TVC-9G ready to go in a cabinet with AC to 12V wall plug supply - contains TVC-9.....**$99**

TVC-12G tunes 1240 to 1300 MHz to TV ch 7 or 8. In cabinet with wall plug AC to 12V supply.....**$109**

ANTENNAS

F718 Diamond vertical omni 9.3 dBd gain, 15 ft long. Specify 70cm video carrier frequency.....**$219**
440-6X KLM 8.9 dBd gain 420-450 MHz 6 element beam. 28" boom, end mounted.....**$59**
440-10X KLM 11.2 dBd gain 420-450 MHz 10 element beam 64 " boom, end mounted.....**$72**
440-16X KLM 14.2 dBd gain 420-450 MHz 16 element beam 10.5 ft boom, center mounted.....**$129**

3318LYARM Downeast Microwave 14.2 dBd gain 902-928 MHz beam. 6 ft boom, end mounted....**$82**

F1230 Diamond vertical omni 11.3 dBd gain, 10.5 ft long **$159**
2424LYRM Downeast Microwave 16.2 dBd gain 1240-1300 MHz beam. 6 ft boom, end mounted...**$82** 1/92

VIDEO COLOR PROCESSOR

WITH FADER AND METER

by Anthony Stevens

Inexpensive color processor you can build creates professional fades, reduces noise and corrects color errors generated by video cassette recording.

VIDEO CONTROL

This color processing amplifier is designed to correct color and contrast errors, create professional quality fade ins and fade outs and eliminate unwanted colors and video noise.

Independent controls for the FADER, BACKGROUND, LEVEL and TINT allow versatility of picture color control that is unobtainable with a TV set or monitor alone. By proper adjustment of these controls and use of the FLASH FILTER, when indicated, TRUE COLOR can be realized. A bypass switch, which overrides all other functions is also provided.

THE CIRCUIT

Since color is composed of two unrelated signals, luminance (black and white) and chroma (color) (figure 1) each signal must be independently processed and then mixed with the other prior to the output. The luminance signal contains the picture information, while the chroma signal contains the color information and a color burst reference for interpretation of the color information. Color hue is determined by the phase relationship between the color subcarriers and the color burst, which is adjusted using the TINT control R 86. Color saturation is directed by the amplitude of the color subcarrier, R 82.

VIDEO COLOR CORRECTOR

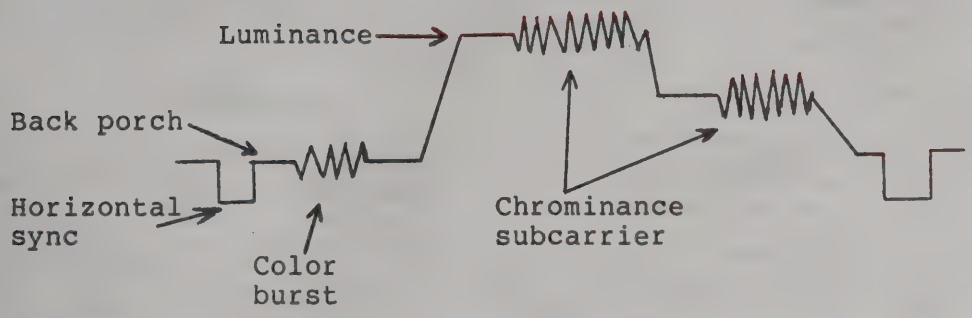


Fig. 1. Composit video signal.

The processing sections of the color corrector are diagrammatically represented in figure two (above). Video input enters the chrominance separator and leaves as 1) the luminance sync signal and 2) the chroma and burst signal. The luminance sync signal goes to both the sync separator back porch timer and the back porch clamp. The back porch clamp is controlled by the back porch timer. From the back porch clamp the signal enters the sync and luminance separator. The luminance signal then enters the sync the chroma nd luminance mixer and the sync pulses are properly restored in the sync shaper and sent to the sync and burst mixer.

The chroma subcarrier and burst signal from the chrominance separator goes to the chroma and burst separator (Q22 and Q28) which is controlled by the sync separator back porch timer. The chroma subcarrier is sent through the buffer amplifier and then passes through the FLASH FILTER, BACKGROUND and LEVEL control sections prior to being mixed with the luminance. The burst passes through the TINT control (phase shifter) and is mixed with the restored sync pulses in the sync and burst mixer.

Signal from the Chroma and luminance mixer passes through the FADER and into the output amplifier mixer where it is mixed with the signal from the sync and burst mixer. The meter monitors the processed video output from the output amplifier mixer.

The video signal enters at J1 and is buffered by Q1. The color subcarrier with burst are separated from the video by L1, C4 filter. The luminance and sync are amplified through Q2 and Q3. Q4 restores DC level by clamping the video at the back porch. The back porch timer (Q14, 15, 16, 17, 18) strips the sync and generates a pulse during the back porch from the signal at Q3.

The sync and luminance are separated by Q5, 6, 7, 8, and sent to the luminance fader circuit and the sync restoration circuit. The sync is amplified and shaped by Q7 and diodes CR1, 2, 15, then mixed in to Q9, 10 which feed the top of the FADER control. The luminance is amplified through Q11 to the other side of the FADER control. When R31 rotates toward Q9, only sync pulses are passed. When R31 rotates toward the collector of Q11, both sync and video are passed. The back porch synchronizes the color professing section by gating the sync burst independently from the color signal with Q22, 28. The color subcarrier is amplified by Q19, 20. The color burst is partially phase shifted by Q25, C25 and R73. The TINT control (variable shift network) composed of R86, C27, C28, Q27 gives additional phase shift advance or retard. . The color burst is then mixed back with the sync pulses through C10, R27, to Q9. The remainder of the chrominance subcarrier is amplified by Q23, 24 and then limited by CR 6, 7 the FLASH FILER. After limiting, the background noise gating diodes CR 8, 9 whose bias is controlled by R81, set an amplitude that is adjusted to block out low level noise. The LEVEL control, R82, adjusts the amount of color carrier. The chrominance signal is then mixed in with the luminance at the emitter of Q11. The output of the FADER control feeds the output amplifier Q12, 13 and then to the video output J2.

From the output of Q13, the total signal is amplified by Q31 and goes to the meter drive circuit. The signal is clamped at Q33 by Q32 driven by a timing pulse from the sync separator Q15. This gives a reference level for amplifier Q33. The signal is amplified and rectified through Q34 which drives the LED circuit Q35, 36, 37, 38.

VIDEO COLOR CORRECTOR

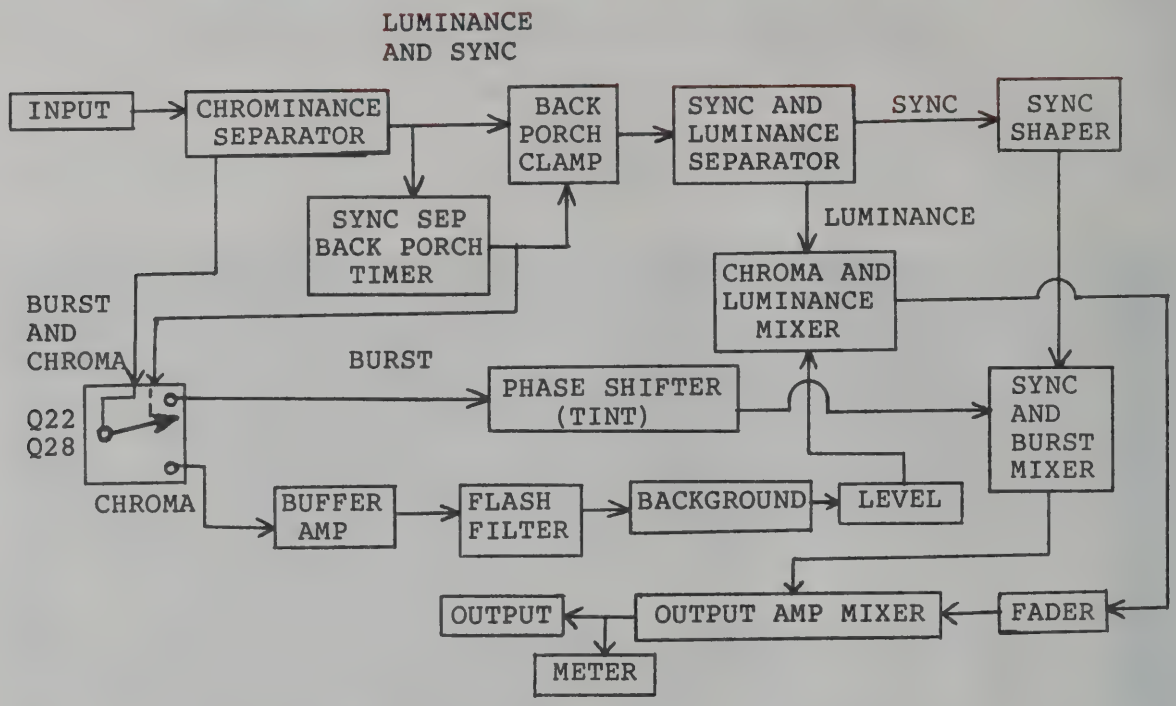


Figure 2. Block diagram

COLOR VIDEO CORRECTOR

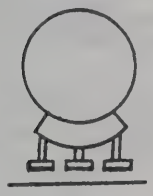
SWITCHES & POTS

Before soldering the pots onto the circuit board the pot terminals must be flattened to align with the center of the pads on the circuit board.

FLATTENING

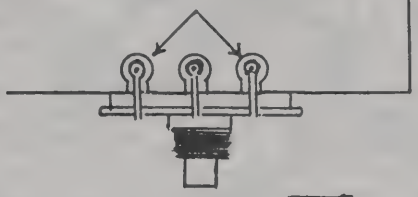
BEFORE

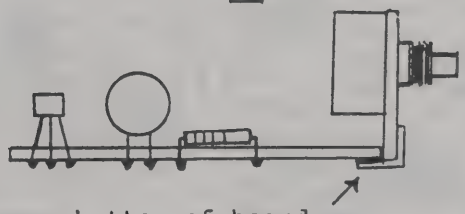
AFTER



ALIGNING

Align in center of pad.





Solder on bottom of board.

CALIBRATION

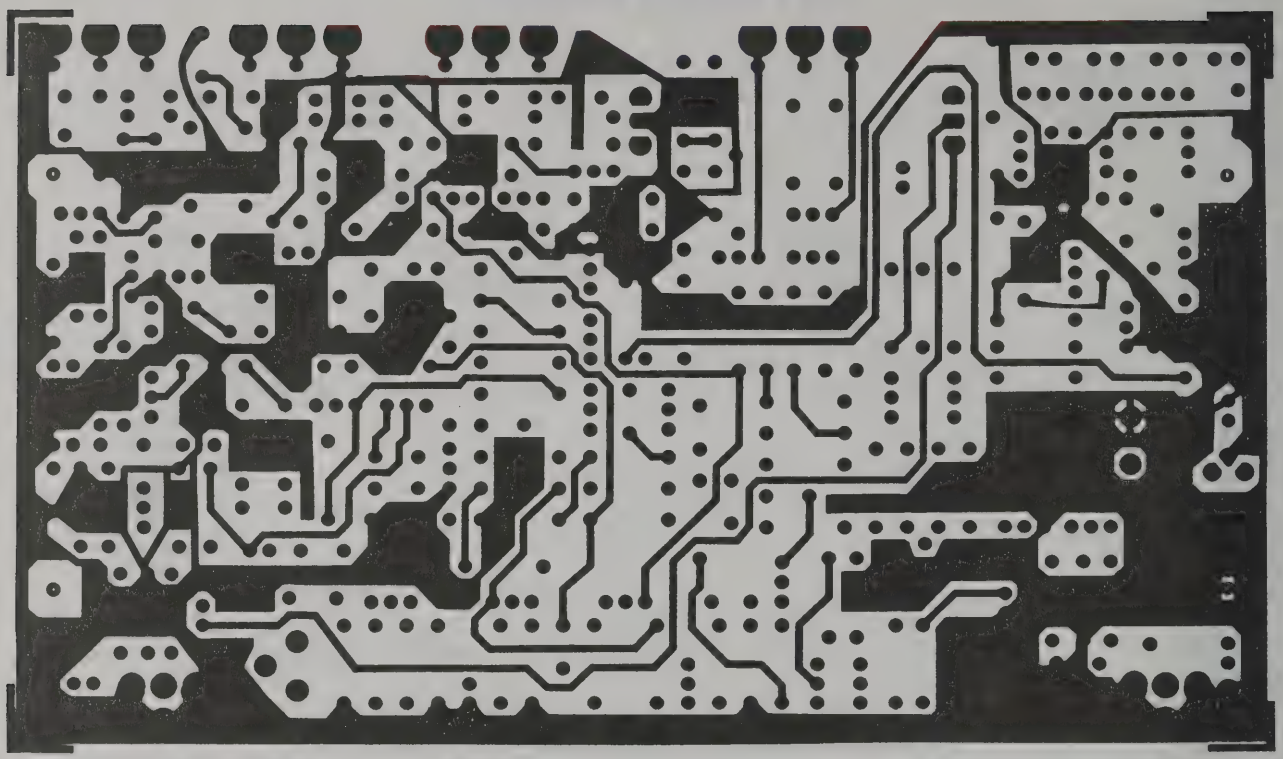
Start-up initial control settings: POWER = ON, S1 = PROCESS, FADER = 12 o'clock (adjust for slight flickering of 100% picture level LED), FLASH FILTER (S2) = OFF, BACKGROUND = Full Counter-clockwise, LEVEL = full counter-clockwise, TINT = 12 o'clock. Adjust internal C4 until color disappears and only a black and white picture is on the TV screen. Set the front panel controls as follows: BACKGROUND, full clockwise; LEVEL, full clockwise; S1, bypass. Observe the picture (brightness, level, tint). Now set S1 in process and adjust the FADER, TINT, and LEVEL controls so that the picture quality is the same as in bypass. Flip S1 back forth for quick comparison. When the picture has about the same quality check the position of the TINT control for between 10 and 2 o'clock. If not, you may want to change R73 to between 820 and 1500 ohms for a 12 o'clock position. The LED meter 100% should flicker when a very white scene is played. You may change R103 to between 330 and 560 ohms in order to calibrate the meter.

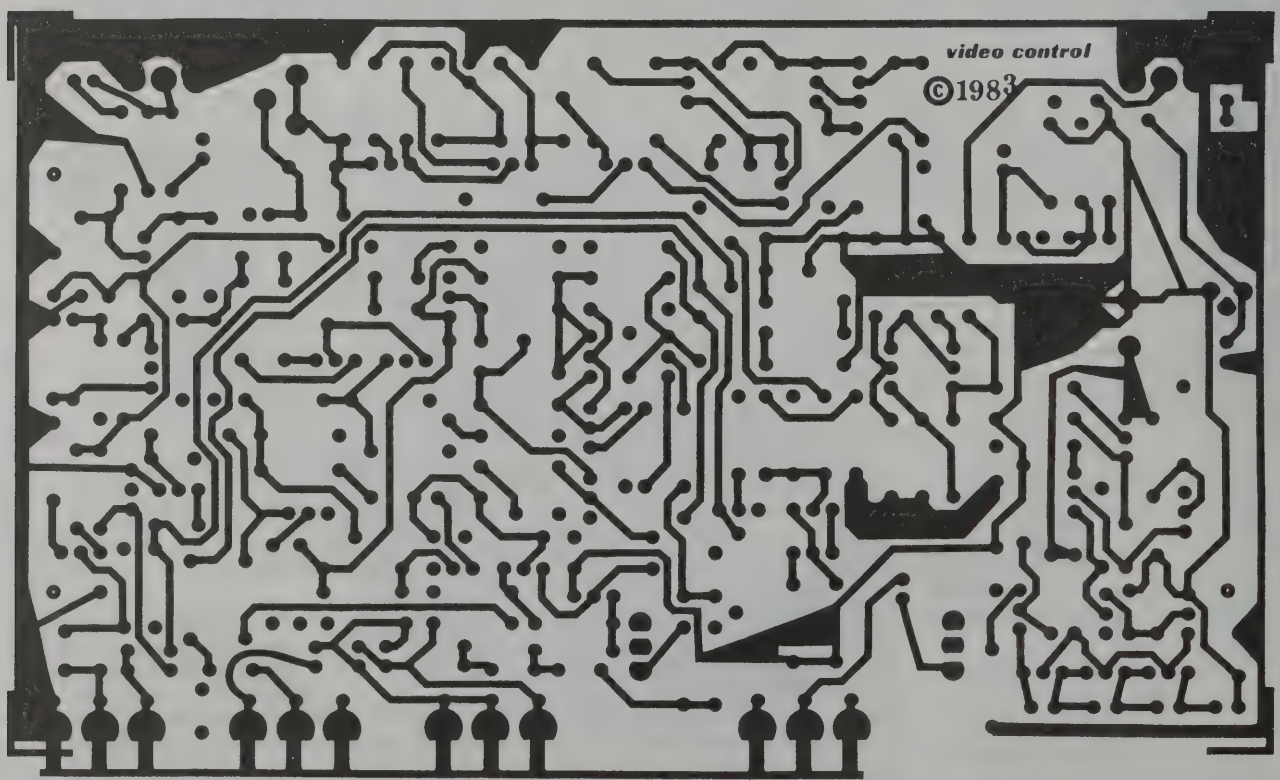
CONTROLS AND FEATURES

POWER	Turns the unit ON and OFF.
BYPASS	Allows instant comparison of the processed signal with the unprocessed signal.
FADER	Allows fade to black for professional pause editing.
FLASH FILTER	Our exclusive circuitry for eliminating annoying color bloom or single color dominance.
BACKGROUND	Our exclusive noise reduction circuitry prevents color noise buildup.
LEVEL	Sets the color intensity for proper record level.
TINT	Corrects phase distortion caused during the taping process. Adjust for normal skin tones.

COLOR VIDEO CORRECTOR

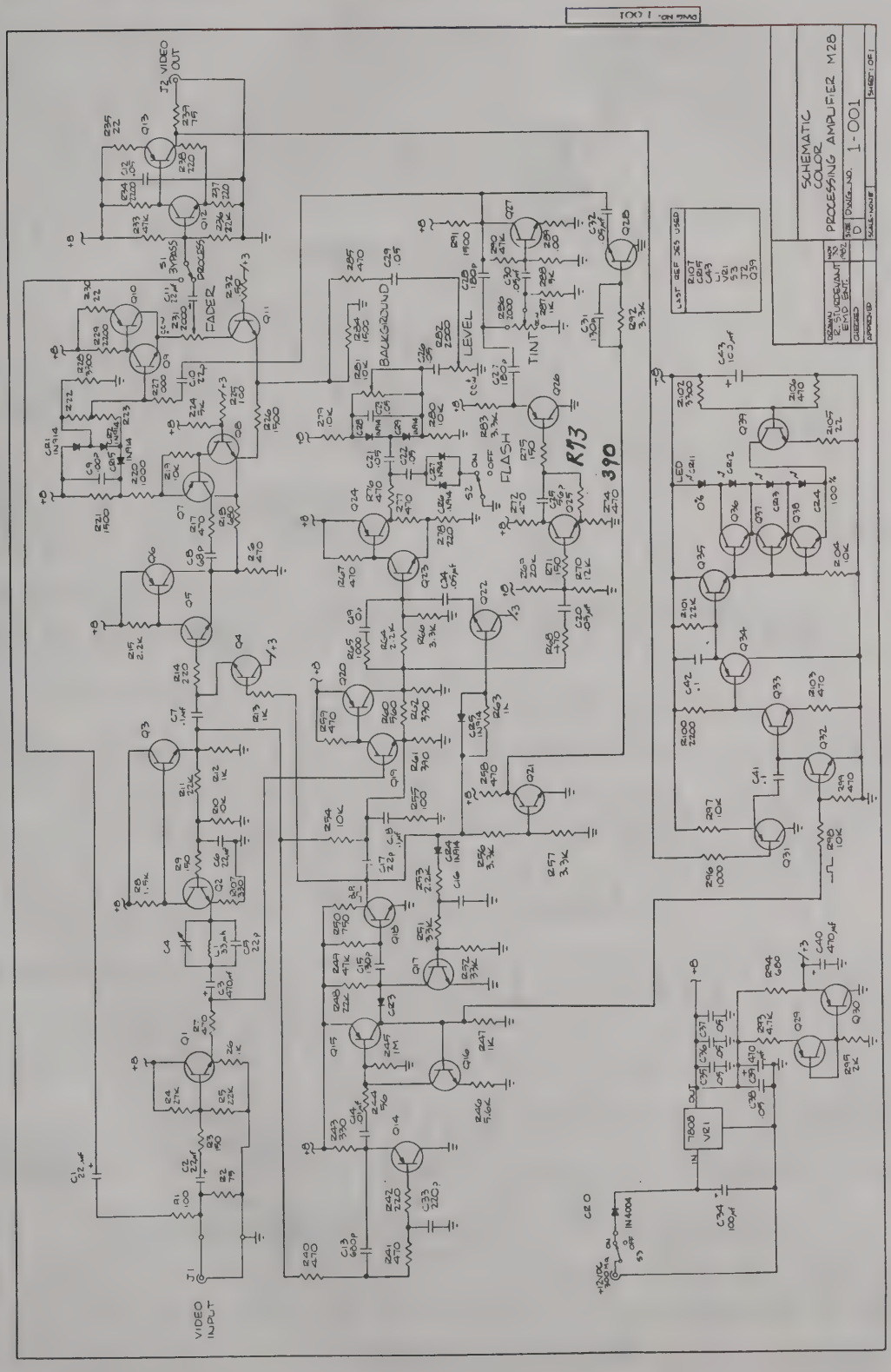
FOIL OF CIRCUIT BOARD





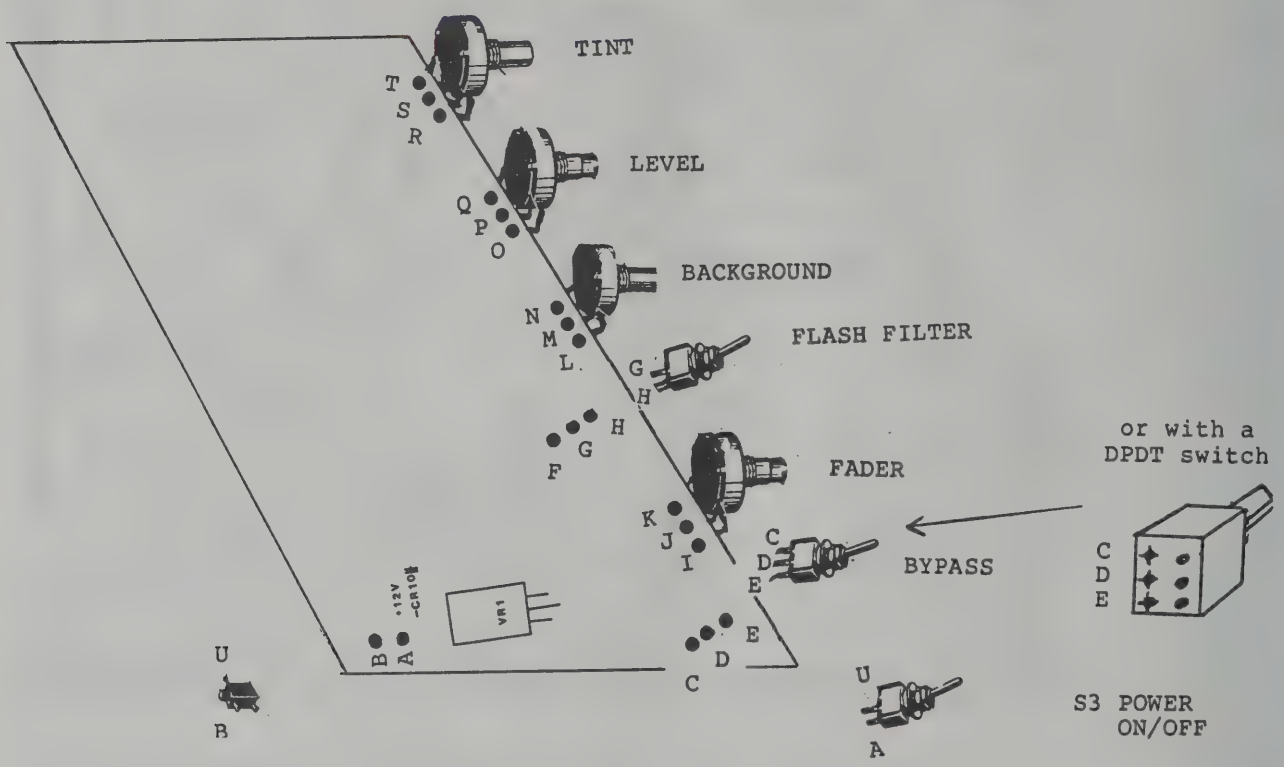
COLOR VIDEO CORRECTOR

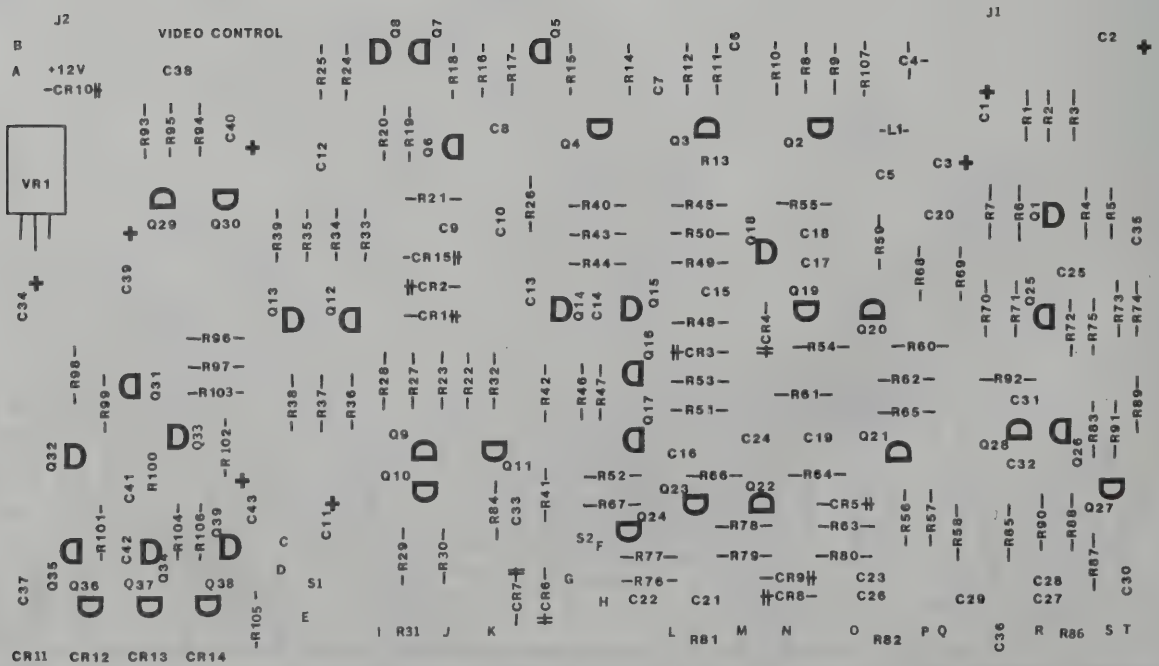
SCHEMATIC



VIDEO COLOR CORRECTOR

MECHANICAL ASSEMBLY





The #1 ATV magazine in the world invites you to SUBSCRIBE Now!

This is your 'Q' to subscribe to AMATEUR TELEVISION QUARTERLY!

There is no better source for ATV than ATVQ. Every issue of ATVQ brings you the latest in: ATV ACTIVITY ON EARTH AND IN SPACE! PUBLIC SERVICE ATV ACTIVITY, BUILD-IT PROJECTS, FIRST HAND ACCOUNTS OF ATV ACTIVITIES, NEWS, ARTICLES AND FEATURES, INSIGHTS FROM THE EXPERTS, NEW PRODUCT REVIEWS, TECHNICAL INFO, AND LOTS MORE!! Don't miss the action subscribe NOW! More non ad copy than the average issue of 73, CQ and more technical articles than QST! Subscribe to Amateur Television Quarterly (ATVQ) today!

Rates:	US	CANADA	DX
1 yr	$18	$22	$35
2 yr	33	40	65
3 yr	48	58	90
4 yr	63	76	110
5 yr	75	94	125
LIFE	400	500	875

NOTE: rates effective Oct 1, 1991

NAME _____ **CALL:** _____ **PHONE** _____

STREET: _____

CITY: _____ **STATE/PROV:** _____ **ZIP:** _____ **+4** _____ **COUNTRY:** _____

Voice coordination frequency for ATV in your area? _____

Amateur Television Quarterly (ATVQ)

Your quality authoritative accurate source every issue. Yes, enter my subscription to Amateur Television Quarterly. I've enclosed a check or money order. Or bill my Visa or M/C: #_____ expires:_____. sign name here:_____

OTHER PUBLICATIONS AVAILABLE THROUGH ATVQ

CQ-TV quarterly publication of the British Amateur Television Club. $21/yr _____ yrs $_____
VHF Communications, quarterly publication of VHF and up construction projects. $27/yr. _____ yrs $____
BATC SSTV Handbook. Quality reference for slow scan TV. $11.25 _____ copies $_____
BATC ATV Compendium Collection of quality build it projects. $11.25 _____copies $_____
(Foreign subscriptions include a funds exchange fee, books are post paid.)

NEW BOOK

ATV SECRETS FOR ASPIRING ATV'ers. Everything for the beginning ATV'er. topics cover all aspects of ATV operations, DX, fun things to do, cheap and easy ways to get started, essential information on making contact, getting local ATV info, examples of ATV activity & index to over 500 recent articles and features about ATV. $11.50 post paid or $9.50 with ATVQ new subscription order. (Canada $12.50/$11.) _____ copies $_____

VIDEO TAPES that can't be shown on commercial TV!

British TV out-takes and bloopers (approx. 12 hours) Rated hard R. $60/set of 6 tapes. _____ copies $_____
US TV out-takes and bloopers (approx 12 hours). Rated hard R. $60/set of 6 tapes. _____copies $_____

SEND TO: AMATEUR TELEVISION QUARTERLY (ATVQ)
1545 LEE ST. #73
DES PLAINES, IL 60018
CHARGE BY PHONE: 708 298 2269 FAX 708 803 8994

Note: There is a 6.5% bank fee on charge orders.

from the publishers of ATVQ

ATV SECRETS FOR ASPIRING ATV'ERS

Volume I

If you enjoy ATV and would like more information about ham TV then you should order Volume I of **ATV SECRETS.** Volume I is a non technical guide to everything you ever wanted to know about ham TV but didn't know whom to ask. Volume I includes clear easy to understand explanations of all aspects of HAM TV. Twenty five topics cover television theory, with accurate charts and useful information about video and ham TV operations. Like ATVQ, **ATV SECRETS** Volume I is highly illustrated with over 110 photos, charts and diagrams. **ATV SECRETS** is entirely new and includes information not available anywhere else.

NO LIGHTWEIGHT!
OVER 20,000 WORDS, OVER 110 PHOTOS, DIAGRAMS, CHARTS, ILLUSTRATIONS

ATV SECRETS Volume I is available now. An easy to read, fun tour of every aspect of ham TV. It is a highly condensed essence of ATV operations and technical information about receivers, transmitters, how to DX, What your watt meter is really telling you and much more. It contains no fat, no hyperbole, no trivial matters, no obscure useless information, no 20 year old reprints; just the facts in easy to understand language! **ATV SECRETS** Volume I is destined to be a life long reference book for any video active ham or video hobbyist.
Cover price $9.98

Order form: Yes, its time to enjoy ham radio again with ham TV. I would like to know more and get the background information that will enable me to fully enjoy, understand and operate ham TV. Here is my order.

NAME _____ CALL _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Please send _____ copies of **ATV SECRETS** Volume I at the post paid price of $11.50 each. (Canada $12.25)
Check/Visa/Mastercard

Card # _____ EXP _____ Signature _____

Send to: ATVQ, 1545 Lee St., Des Plaines, IL 60018. Or Phone 708 298 2269, FAX 708 803 8994.

A GREAT CHRISTMAS GIFT FOR THAT SPECIAL PERSON IN YOUR LIFE!

from the publishers of ATVQ

ATV SECRETS FOR ADVANCED ATV'ERS

Volume II

If you enjoy this magazine, and would like more technical information about ham TV then you should order Volume II of **ATV SECRETS.** Volume II is the technical extension of ATV SECRETS Volume I and includes dozens of build it projects for all kinds of video hardware and software, television theory, accurate charts and more useful information about video and ham TV. Like this magazine it is highly illustrated with photos and diagrams. Volume II also includes a large section on FM video, a large section on ATV repeaters and how to build them, detailed technical information on all aspects of ham TV.

NO LIGHTWEIGHT

ATV SECRETS Volume II is in its final stage and will be available soon. It is currently over 200 pages long! This is a major effort to produce an encyclopedia of ATV technical information useful for yers to come. **ATV SECRETS** Volume II is destined to be a life long reference book for any video active ham or video hobbist. It includes complete detailed explnations of the NTSC television signal, NTSC color generation and RF transmission. Complete details of the VSB signal and what the real difference is between VSB and DSB video signals. The perfect companion for the technically oriented ham.

Cover price $24.95

Pre-publication DISCOUNT order form:
Yes, now that I have gotten my feet wet in ham TV, I would like to know more and get the background technical information that will enable me to fully participate, build, understand and enjoy the technical aspects of ham TV and video. Here is my pre-publication order which entitles me to a $5 discount off the cover price.

NAME _____ CALL _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

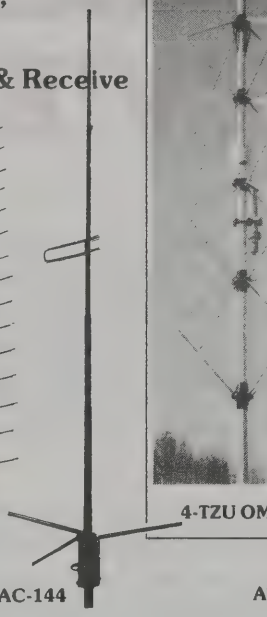
Please send as soon as available, _____ copies of **ATV SECRETS** Volume II at the pre-publication discount price of $20 each. Check/Visa/Mastercard Card # _____ EXP _____

Signature _____
Discount offer expires April 30, 1992! So order TODAY!
Send to: ATVQ, 1545 Lee St., Des Plaines, IL 60018. Or Phone 708 298 2269, FAX 708 803 8994.

ANTENNAS by Lindsay

Amateur TV Repeaters, Verticals and Yagis Transmit & Receive Antennas

4ZZ-420

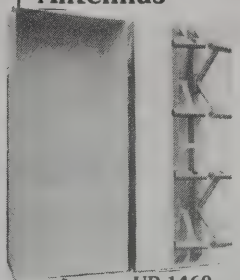


AC-144

4-TZU OMNI

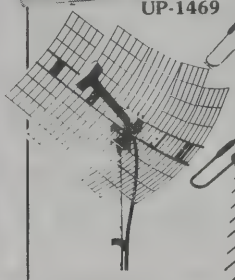
ATV-8 SLOT

LPTV & MMDS Transmit & Receive Antennas

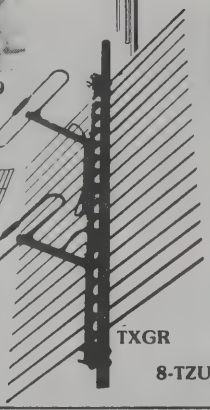


UP-1469

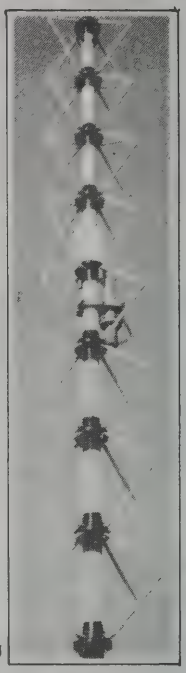
LS4
LS8
LS16
SLOT



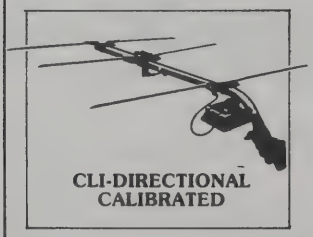
MDG-2717



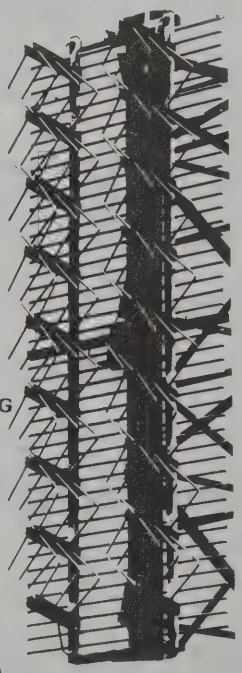
TXGR
8-TZU



Cable TV & SMATV Headend Yagis, Log Periodics, Pre Amps and CLI Antennas

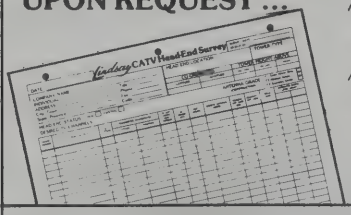


CLI-DIRECTIONAL CALIBRATED

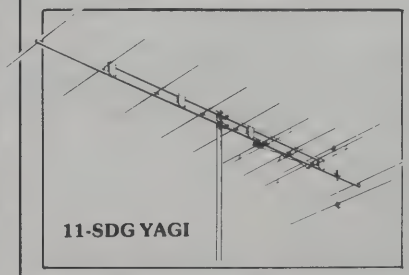


ZIG-ZAG SERIES

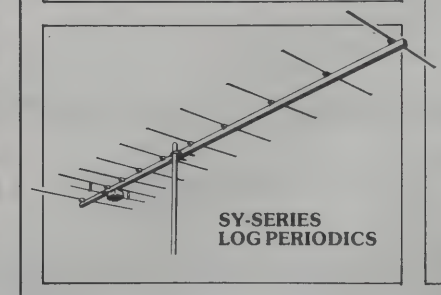
'FREE' SITE SURVEYS UPON REQUEST ...



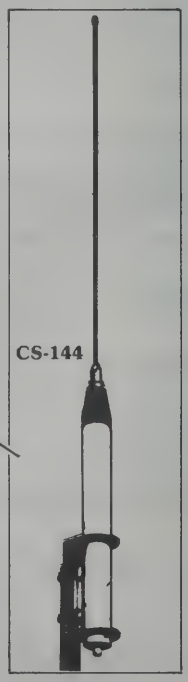
Commercial 2 Way Cellular Base Station and STL Antennas



11-SDG YAGI



SY-SERIES LOG PERIODICS



CS-144

DEALERS AND DISTRIBUTORS WANTED WORLDWIDE

LINDSAY SPECIALTY PRODUCTS
50 Mary Street, Lindsay, Ontario, Canada K9V 4S7

Telephone:
(705)324-2196

Fax:
705-324-5474

VIDEO COLOR CORRECTOR

Parts List

All capacitors 10% tolerance:
C1,C2,C6,C11 -- 22uF, 10V electrolytic capacitor
C3,C40 -- 470 uF, 10V electrolytic capacitor
C4 -- 5-55pF trimmer capacitor
C5,C10,C17 -- 22 pF, 50V disc capacitor
C7,C18,C41,C42 -- O.1 uF, 50V disc capacitor
C8 -- 68 pF, 50V disc capacitor
C9 -- 100 pF, 50V disc capacitor
C12,C20 through C24,C26,C29,
C30,C32,C35 through C38 -- .05 uF, 50V disc capacitor
C13 -- 680 pF, 50V disc capacitor
C14 -- .01 uF, 50V mylar capacitor
C15,C31 -- 130 pF, 50V disc capacitor
C16 -- .001 uF, 50V disc capacitor
C19 -- 10 pF, 50V disc capacitor
C25 -- 56 pF, 50V disc capacitor
C27,C28 -- 180 pF, 50V disc capacitor
C33 -- 220pF, 50V disc capacitor
C34,C43 -- 100 uF, 10V electrolytic capacitor
C39 -- 470 uF, 35V electrolytic capacitor

CR1 through CR9,CR15 -- IN 914 or IN4148 diode
CR10 -- IN4004 rectifier diode
CR11 through CR14 -- MIL317 LED's

J1,J2 -- RCA phono jack
J3 -- miniature phono jack

L1 -- 33 uH high Q inductor coil

Q1,Q2,Q3,Q4,Q5,Q8,Q9,Q11,Q12,Q16,Q17,
Q18,Q19,Q21,Q23,Q25,Q27,Q28,Q32,Q33,
Q35 throughQ39-- General Electric 2N3904 npn transistor
Q6,Q7,Q10,Q13,Q14,Q15,Q20,Q24,Q26,Q29,
Q30,Q31,Q34 -- General Electric 2N3906 pnp transistor

All resistors 1/4 watt, 5% tolerance:
R1,R25,R55,R89 -- 100 ohms
R2,R39 -- 75 ohms
R3,R9,R32,R71,R75 --150 ohms
R4 -- 27,000 ohms
R5,R11,R36,R48,R101 -- 22,000 ohms
R6,R12,R13,R20,R47,R63,R65,R73,R87,R96 -- 1000 ohms
R7,R16,R17,R40,R41,R58,R59,R67,R68,R72,
R74,R76,R77,R85,R99,R103,R106 -- 470 ohms
R8,R26,R84,R91 -- 1500 ohms
R10,R19,R54,R79,R80,R97,R98,R104 -- 10,000 ohms
R14,R37,R38,R42,R78 -- 220 ohms
R15,R21,R29,R34,R53,R64,R95,R100 -- 2200 ohms
R18,R94 -- 680 ohms
R22 -- 6800 ohms
R23,R27,R93 -- 4700 ohms
R24,R88 -- 15,000 ohms

VIDEO COLOR CORRECTOR

PARTS LIST CONTINUED

R28,R56,R57,R66,R83,R92,R102 -- 3300 ohms
R30,R35,R105 -- 22 ohms
R33,R49,R90 -- 47,000 ohms
R43,R62,R107 -- 330 ohms
R44 -- 56 ohms
R45 -- 1,000,000 ohms
R46 -- 5600 ohms
R50 -- 750 ohms
R51,R52 -- 33,000 ohms
R60 -- 560 ohms
R61 -- 390 ohms
R69 -- 20,000 ohms
R70 -- 12,000 ohms

The following are linear-taper potentiometers:
R31,R82,R86 -- 2,000 ohms
R81 -- 10,000 ohms

S1,S2,S3 -- SPDT switch

VR1 -- 7808 8-volt regulator IC

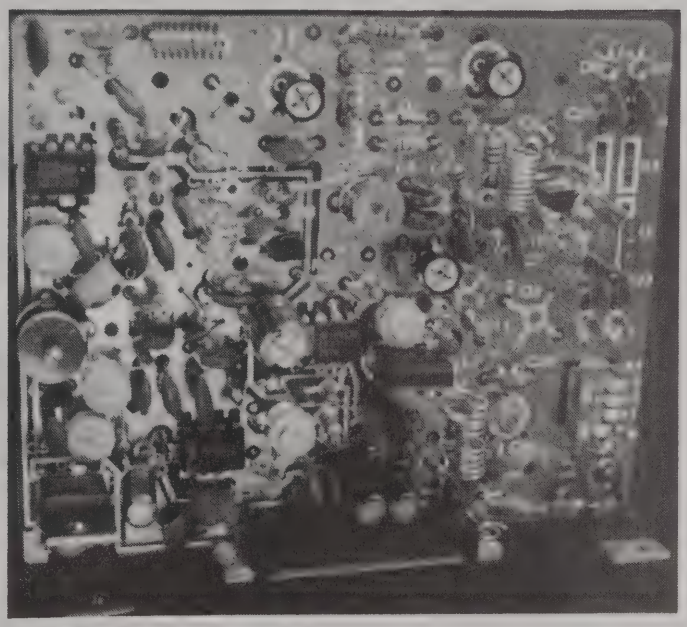
Misc. -- 117-volt ac to 12-volt dc, 300 mA power adaptor; printed circuit board; control knobs; line cord; metal cabinet; machine hardware; hook-up wire; solder; etc.

NOTE: A LIMITED SUPPLY OF COLOR PROCESSOR CHASSIS FOR THIS PROJECT ARE AVAILABLE FROM VIDEO CONTROL 15512 NE. 28TH AVE. VANCOUVER,WA. 98686. PHONE 206-693-3834.

ATV-5 TRANSMITTER

TEN GREAT REASONS TO TRY OUR NEW 70 CM AMATEUR FSTV TRANSMITTER ! !

- 5 WATT AVERAGE RF POWER
- .5–5W ADJUSTABLE RF OUTPUT !
- INCLUDES AUDIO INPUT
- FOUR SWITCHABLE CHANNELS
- DRIVES 50W M67728 BRICK
- ADJUSTABLE SYNC STRETCHING
- CLEAN VIDEO, 300V/USEC AMP
- EXTREMELY SMALL SIZE! (3.5 X 4.0 INCHES)
- MAY BE PURCHASED WITHOUT POWER MODULE



- **HOLIDAY SPECIAL!!**

MODULE CAN BE PURCHASED AND SOLDERED IN LATER FOR 5 WATT AVERAGE OUTPUT POWER. POWER WITHOUT MODULE FROM DRIVER IS APPROXIMATELY 50 MILLIWATTS.

NOW $189.00

$149.00 LESS 5 WATT MODULE

(CHECK OR MONEY–ORDER)

PHONE: (602) 843–3585

Calls accepted after 6pm M–F (local) Includes one xtal for 434 MHz. Additional frequencies for 426.25, 427.25, and 439.25 are $15 ea. 421.25 available if a VSB filter is used for a repeater transmitter. Include $5 for shipping and handling. AZ residents add 6.7% sales tax.

ATV ELECTRONICS
16807 N. 46LN
GLENDALE, AZ. 85306

900 MHz. Amplifier For ATV

by John P. Spaeth KDØLO

Even though some transistors are meant to run in class C amplifier service, some of the common emitter variety can be biased to run as class AB_1. Although these transistors are usually not very linear, one can usually find a bias point at which the transistor is more linear than at other points. The goal is to try to find the most linear portion of the device's "linear curve". This point may and probably will vary from transistor to transistor.

MRF-873

Here is specific information on one such class C device which can be biased for "linear operation" in ATV. The MRF-873 is a common emitter device which will exhibit up to 15 db gain over a limited power range. Although Motorola specs the device to 7 db gain, when it is biased it really takes off.

Below is a board print designed around the s parameters Motorola provides for the device. Notice the board is divided in two pieces (i.e. input, output).

The Motorola 873 is an NPN silicon power transistor designed to be used in the 800-960 MHz. band. It is designed for common emitter class C use and doesn't work well for wide band television class ab_1 service. Although listed as a 15 watt peak device, you should not expect to see more than 5 watts average power out of the this device before severe sync compression is noted.

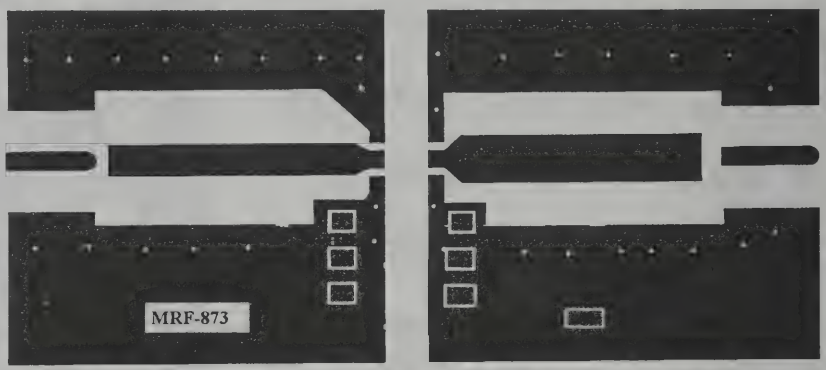


Figure 1 Actual size board print for MRF-873. Board material is g-10/fr-4 1/16 inch double sided glass epoxy

BIASING THE TRANSISTOR

The up side to the device is the tremendous gain it exhibits at low power operation. The device can be driven to 5 watts output with 75-100 mW of rf drive power from your television transmitter.

The transistor is prone to IMD when running class ab, and both low and high frequency distortions are plentiful. This device is not the device of choice for good linearity. As a matter of fact, the class C 900 MHz. power modules from Toshiba (SAU11), would be an equal and probably less expensive choice, however until this country is invaded with the 900 MHz. class AB power modules, an amplifier such as the MRF-873 would suffice.

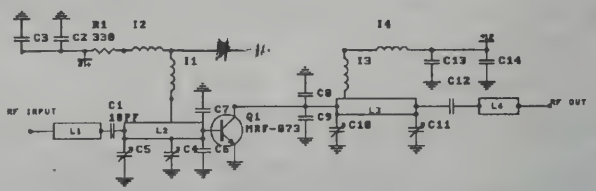


Figure 2 Schematic diagram of MRF-873. Microstriplines are reproduced from board print

PARTS LIST:

D1-IN4001 DIODE
C1,C12=47 PF CHIP
C5,C4,C10,C11=1-10 PF CER TRIM OR PISTON
R2=10 OHM
R1=330 OHM
C6,C7,C8,C9=8 PF CHIP
L1,L4=8 TURNS #22 1\8 AIR
L2,L3=10 TURNS #22 1\8 AIR
C2,C13=.001 MFD
C3=.01 MFD
C14=1000 MFD
FB1,FB2=WIRE JUMPER WITH BEAD
NOTE-R1 NOT SHOWN ON PARTS LAYOUT IS USED AS JUMPER BETWEEN PADS OF C3 AND C13. +12.5 VDC IS APPLIED TO PAD OF C-14

I found the transistor to operate best when biased for 40 ma idle current. The bias network should incorporate a variable resistor so different bias voltages can be tried during setup of the amplifier. Again, because we are working within the narrow confines of a class C transistor's limited linear range, the bias voltage point, and the rf drive level must be just right to insure the transistor is turned on at the right point of its linearity curve. Adding the 10 ohm resistor from the base to ground seemed to help with oscillations. Although the microstriplines will resonate fine with one variable capacitor on each line, adding a second tended to widen the bandpass of the quarter wave matching sections thus allowing a better response for wideband rf drive.

HOME VIDEO NEWSLETTER

If you ever wished you had first hand information about making good videos, for home or ATV, or had ideas you might want to make some money with your video equipment, take note. There is an excellent newsletter and a complete set of inexpensive video tapes (VHS) some of which may be free with a subscription to the newsletter. The publication is called Group M Productions and is published by Bill Myers, 321 Ouachita Ave., Hot Springs, AR, 71901. (501 321 1845. Bill produces videos using inexpensive home/prosumer equipment and the newsletter and videos explain how to do it and how not to do it! Each issue has had lots of good first hand information although you have to read past a lot of sales hype. Sort of like the DAK catalog adz which devote a page to explain the wonders of the product then get to the price! But in between the editorials and sales copy are golden gems of information useful to make interesting and possibly saleable videos with your home video gear. I've been doing these "industrial" videos for years (you didn't really think all the video gear I have was just for ATV did you?) and Bill's information is right on target. Call or drop them a line for a free issue and other info. Please, tell them you read about it in ATVQ. 73 Henry KB9FO

900 MHz. Amplifier for ATV

BOARD CONSTRUCTION

The circuit board is constructed on G-10/FR-4 glass epoxy double sided circuit board which is 1/16 inch thick. The glass epoxy did not seem to exhibit much loss at 900 MHz.. The ground plane on the top of the board is tied to the underside with plate through holes, and the edges of the board are wrapped with brass or copper foil and soldered. Additionally the board should be fastened to the heat sink in four places per side. Care must be taken if rivets or eyelets are used for the plate through holes so that the board sets flat on the heat sink. Relief countersinking may be needed to the heat sink so that undue stress is not put on the board or the transistor. The circuit boards and transistor are mounted directly to the heat sink so either a spacer will be needed between the circuit boards and the heat sink, or a 1/4 channel will have to be milled in the heat sink for the flange of the transistor since it is roughly twice the thickness of the circuit board.

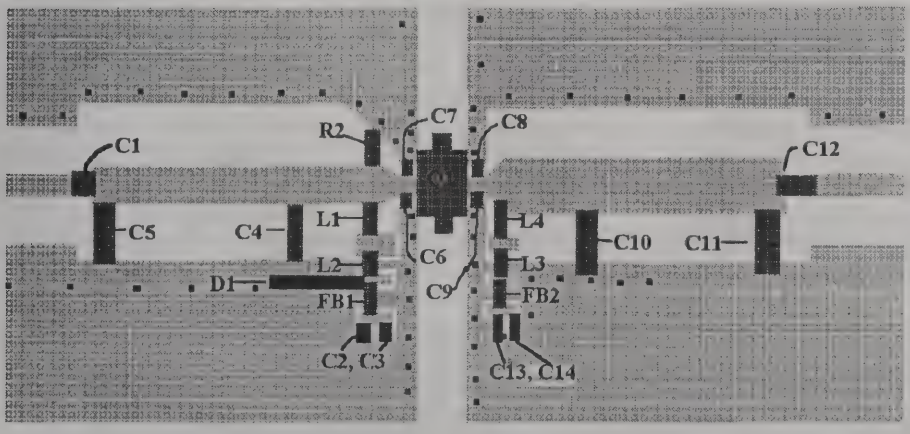


Figure 3 Parts placement for the MRF-873 amplifier. Note the plate through holes. The edges of the board should be wrapped with foil and soldered.

CONCLUSION

I was not pleased with the outcome of this project. As I stated earlier, this is an expensive transistor and no more linear than the class C power modules which are less expensive. Still if one could find some of these transistors on the surplus market, they would suffice however current retail price for these devices $48-$54, and this is a bit pricey for a class C device. In the next issue I will be taking a closer look at some NEC devices for 900 MHz. 73's until then...John

THE TRUTH ABOUT VSB TRANSMISSIONS

SPECTRUM USE AND VIDEO

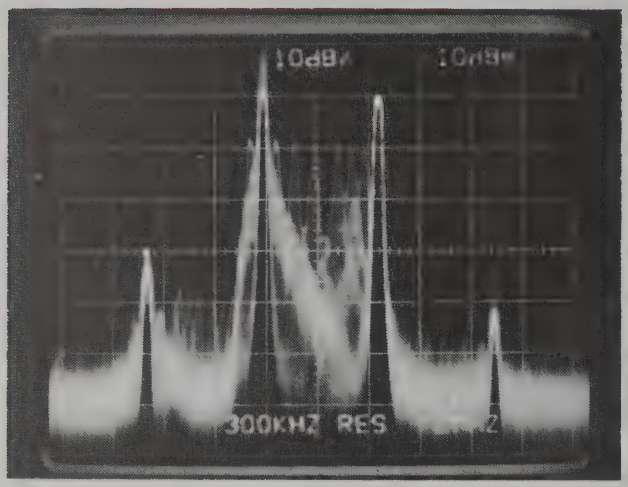


Photo A

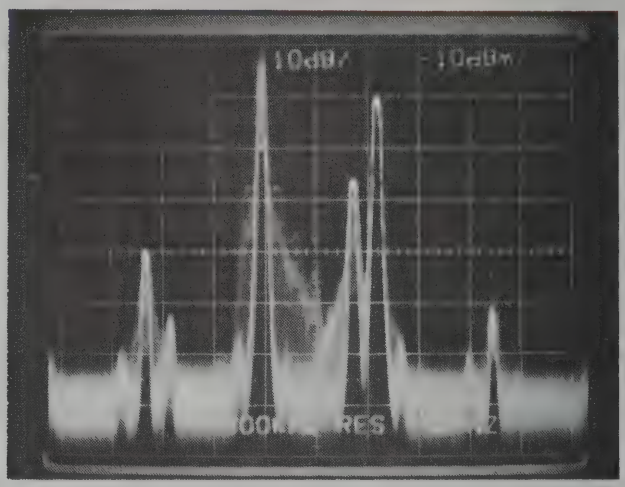


Photo B

Just read another publication in which it was stated that VSB bandwidth is HALF of DSB ATV. Sorry, not true! VSB is 2/3's the width of full DSB. The V stands for Vestige, thus vestigial side band which is NOT SSB, single sideband! The definition of NTSC video says the video bandwidth is 4.2 MHz. at which point there is a roll off so that at 4.5 MHz. the aural carrier is not receiving interference from the video. Thus the DSB signal is slightly over 9 MHz. wide (4.5 + 4.5 + audio deviation of 25 KHz). see Figure 1.

VSB filtering is defined by the FCC as starting at 0.75 MHz, and reduced to an insignificant level by 1.5 MHz. So a VSB signal is 4.5 + 1.5 + audio deviation or slightly over 6 MHz. Since the audio deviation is the small, you can round off the bandwidth to 9 MHz for DSB and 6 MHz for true VSB. 6/9 = 2/3 not 1/2! see Figure 2.

The advantage of VSB operation is you have removed your unneeded opposite side color and sound sidebands. This will reduce potential interference to other band users IF your VSB filter is in your final output stage or in your antenna lead. As soon as you add any amateur amplifier, the intermodulation distortion present will cause the undesired sidebands to be remade and transmitted. Depending on the amplifier you use, the intermodulation products could be at any level from equal to the desired sideband levels down. The better the amplifier the lower the intermod products but all transmitters generate IMD products. AEA manufacturers an amplifier for ATV use which is designed for low IM.

Pictured here is the RF output of a commercial broadcast TV transmitter. The VSB filter in the final output has been removed and the transmitter is feeding a dummy load for test purposes. The exciter has a SAW filter to remove the unwanted lower sideband. The spectrum analyzer is looking at an RF sample of the final output. The transmitter meets all broadcast FCC specs and is tuned and is operating to the very best possible signal quality, linearity and all FCC specs.

Picture A shows the transmitter modulated with 100% multi-burst. This is a multi-burst signal of 100 IRE. The video field also includes others test signals to form a composite test signal. This can be seen in the sideband energy. The video carrier is on the 5th vertical graticule. The audio is just above the 7th and is 10 dB below the video carrier level.

The signals seen in the first three cm of the display are 3rd order sideband products and the sound carrier is -40 dB and video is -46 to -50 dB. To the right side are the 5th order intermod products, the video carrier is -44 dB and the 5th order video is -55 dB. There is also a little "grass" for the 7th and 9th order products. Keep in mind that the exciter has a SAW filter and the undesired sideband and IM signals from the exciter are more than -86 dB below carrier. The increase is completely from 1 stage of RF amplification!

The second photo is live video from a typical TV program tape playback. The fuzzy bumps located at the same place as the first photo are the same IMD products only under different video input conditions. The 3rd order video carrier is still -40 dB and the video IMD products are narrower. Clearly visible is the 3rd and 5th order color energy as a fuzzy bumps and the and the 3rd and 5th order sound carriers.

The only difference between these signals and your ATV transmitter is that your ATV transmitter IMD products will be stronger! And no matter what VSB generating system is used in the exciter, the RF amplifier stages after any filter will re-insert the sidebands. Its only a matter of degree.

Final note, the slight level difference between the lower and upper frequency multiburst sidebands was from the original signal generator. These are two photos of a complete proof series run on a transmitter which was evaluated by myself and a transmitter engineer from my TV station, conducted at the manufacturers facility.

IDEALIZED PICTURE TRANSMISSION
AMPLITUDE CHARACTERISTIC

§ 73.699

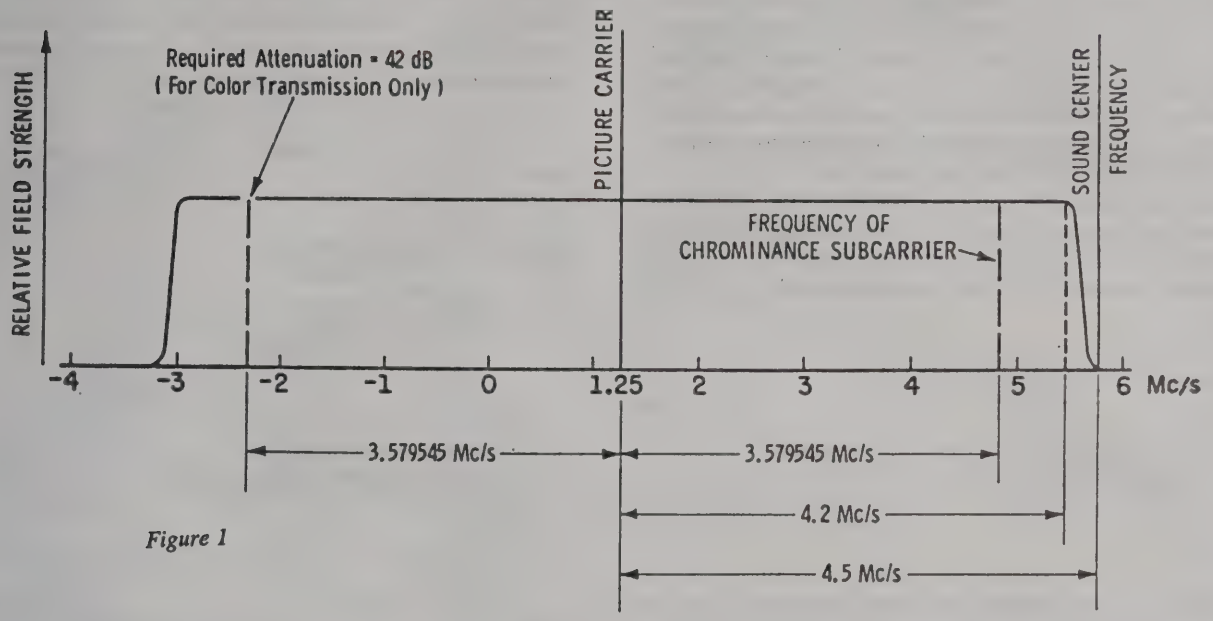


Figure 1

§ 73.699

IDEALIZED PICTURE TRANSMISSION
AMPLITUDE CHARACTERISTIC

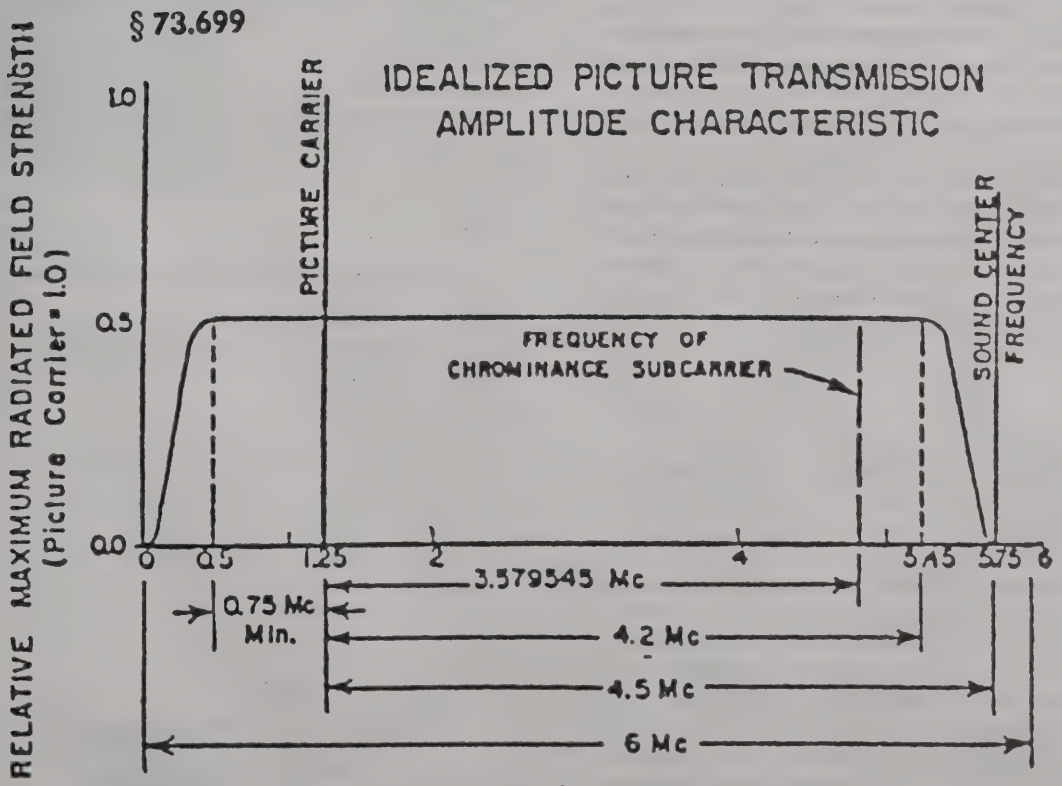


Figure 2

Note: Not drawn to scale

THE TRUTH ABOUT VSB TRANSMISSIONS

SPECTRUM USE AND VIDEO

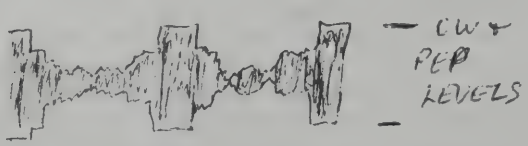
Why do we use VSB and not SSB for TV?

The TV signal is different from most other forms of modulation. In a standard AM transmitter, modulated with a sine wave or a complex waveform for music or voice, the modulation is generally symmetrical. The upper or positive voltage and the lower or negative voltage of the waveforms are about equal over time. Think in terms of a simple sine wave with the 0 volt point in the center with the "curve" of the signal going equally above and below 0 volts. A traditional AC signal. There is essentially no DC component. To avoid complex vector analysis and math, the following explanation has been simplified.

If you modulate a CW wave with the sine wave, and look at the envelope, you will observe the carrier wave is modulated symmetrically with the envelope dipping to near zero amplitude at the negative peaks and nearly double amplitude at the 100% peaks.

The TV signal is different. It has a DC component. You may have heard of DC restoration circuits in your TV receiver. The TV signal is clamped so that the sync pulses are at maximum power which is equal to the CW carrier power. Unlike the sine wave which was double the CW power at maximum power.

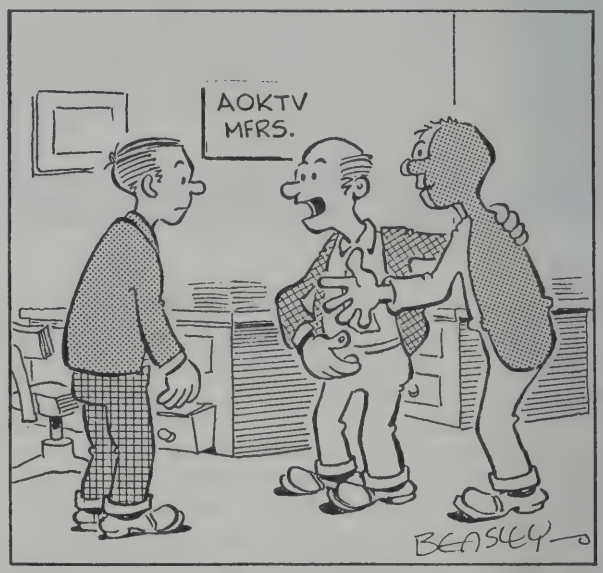
From this maximum power level which is the sync pulse and PEP power for a video signal, we decrease power to 75% for blanking level, 59% for black level and to lower values for video until we reach 12% power for video white. There are also periods of time over which the signal is in a steady state at a fixed level. For instance, the sync pulse should be equal amplitude (flat) for the duration of the pulse, if it is not we say there is low frequency tilt (a distortion) to the signal.



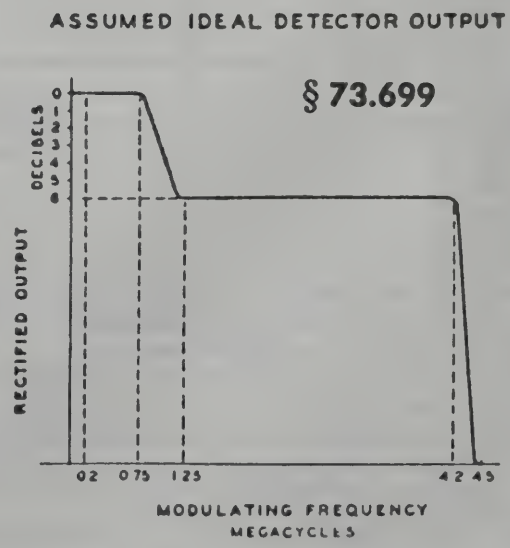
In the transmitter the DC Clamp circuit performs the function of holding the sync to the maximum power level. In your receiver you need to restore this relationship and the DC restorer does this.

Because of this non-symmetrical relationship, there is a DC component to the video modulation signal. The amount is dependant upon the composition of the video signal and it varies with average picture level (APL). Video is Negative modulation only. There is no increase in the RF envelope with video, only decreases from the CW level. This is why your ATV transmitter in a CW mode will read on your watt meter the power which is also the PEP (peak envelope power). Your watt meter then decreases when you add video modulation because you have decreased the average power of the RF envelope!

What happens if you do not have DC restoration and DC clamp? Your TV set video display, what you see on the TV screen must eliminate the scan retrace so you only see the results of the beam scanning left to right, not the return right to left. On a defective set, or old sets which do not have DC



THIS IS "HOPALONG HARRY,"-HE'S OUR VESTIGIAL SIDEBAND CONSULTANT



SPECTRUM INTERNATIONAL, INC.

Post Office Box 1084-T
Concord, Massachusetts-01742
508-263-2145

Si JAYBEAM

MULTI-DIRECTOR 88 ELEMENT
U.H.F. ANTENNA
WITH LAUNCH DIRECTORS

MBM88/70cm

MULTI-DIRECTOR 48 ELEMENT
U.H.F. ANTENNA
WITH LAUNCH DIRECTORS

MBM48/70cm

General Specs:-

Frequency Range	420 MHz - 450 MHz
Impedance (Built-in Balun)	50 Ohms

MULTI-DIRECTOR 28 ELEMENT
U.H.F. ANTENNA
WITH LAUNCH DIRECTORS

MBM28/70cm

	MBM28	MBM48	MBM88
Gain	11.5dBd	14.0dBd	18.5dBi
Beamwidth (E)	40 deg	28 deg	23 deg
(H)	45 deg	35 deg	28 deg
Boom Length	4 ft	6 ft	13 ft
	$ 60.00	$ 115.00	$ 160.00

VHF/UHF BANDPASS FILTERS

KNOCK OUT INTERFERING
QRM OR SELF-DESENSE!

BNC Standard
TNC or Type 'N' optional
(slightly higher prices)

The PSf . . . series of Band Filters are for receiver pre-selector and transmitter use. The filters are 3 pole, 7% bandwidth, 0.1 dB ripple designs with 30 dB shape factor of 4:1.

The PSf . . . ATV series of TV Channel Filters are 5 pole, 6 MHz bandwidth designs. They are used to protect your TV receiver from inband QRM and to "strip-off" the unwanted sideband of your transmitted vestigial sideband signal.

Model	PSf144	PSf220	PSf432	PSf900	PSf1296	PSf1691
Freq (MHz)	140-150	216-228	420-450	890-940	1250-1340	1650-1750
Loss (typ)	0.1 dB	0.1 dB	0.15 dB	0.2 dB	0.25 dB	0.25 dB
	$190.00	$160.00	$105.00	$105.00	$105.00	$105.00

Model	PSf421-ATV	PSf426-ATV	PSf439-ATV	PSf910-ATV	PSf1253-ATV
Loss (typ)	2.0 dB	2.0 dB	2.0 dB	2.5 dB	3.0 dB
Std conns.	BNC	BNC	BNC	N	N
	$155.00	$155.00	$155.00	$180.00	$180.00

All prices FOB Concord, Mass.

PRICES SUBJECT TO CHANGE WITHOUT PRIOR NOTICE

SPECTRUM INTERNATIONAL, INC.

Post Office Box 1084 Dept. T
Concord, Massachusetts-01742
508-263-2145 — Fax #263-7008

THE TRUTH ABOUT VSB TRANSMISSIONS INTERMOD AND AMPLIFIERS

OK! I just spent $150 and got rid of my transmitter undesired sidebands and am operating VSB. Why do my filtered sidebands return when I add an amplifier?

Intermod distortion can be defined as unwanted signals which result from the interactions among two or more desired signals. It is called distortion because it represents a deviation from what is desired. The consequences of IMD in a transmitter are undesired signals (spurs, harmonics and mix products) which can cause interference. In a receiver the consequence is the reception of undesired signals (birdies, images) or a blocking of frequencies which hinder the reception of desired signals.

Any circuit nonlinearity can cause signals to mix. The mixing of two signals can produce harmonics which can be remixed with the fundamental signals to produce various combinations of products. The **ORDER** of the IMD product is related to the number of mix steps between it and the fundamental signal. For example a second harmonic F2 is equal to F1 + F1, which is two steps, making it a second order product. The product of 2F1 - F2 is a third order product and so forth. Some products resulting from two fundamental signals are: second order = 2F1, 2F2, F1+F2, F1-F2. Third order= 2F1 +F2, 2F1-F2, 2F2 + F1, 2F2-F1.

The ORDER is important because generally the amplitude of the IMD products generally decreases as the order decreases. Thus the lower order products have a greater potential for interference than high order. As shown in the photos earlier, the 5th order products are lower than the 3rd order products.

The closer the two signals are in frequency, the closer the odd order products are to the fundamental frequencies. This can easily place them in the broad passband of an amplifier stage. In the case of video, your sideband signals start at your carrier frequency and extend to the sound carrier. Thus the mix products (2F video carrier -1F, video sidebands) fall directly adjacent to the video carrier in a mirror image! (439.25 + 439.25 - 439.2501 = 439.2499!) (the video carrier + the video carrier- the sideband at +1 KHz) And your video sidebands start at 29.94 Hz.

A well designed class AB amplifier would have good IMD levels (within engineering practice and device limitations) levels of -30 dB 3rd order, -40 dB 5th order, -50 dB 7th order etc. With a very non-linear class C solid state amplifier, the IM products will be much higher. Add to that effects on the amplifier from impedance mis-match, over drive levels and a nearly continuous spectrum of signals (carriers and sidebands, color sidebands, sound carrier and sound FM sidebands) and the class C amplifier will bring back the pre-filtered VSB signal to near full DSB levels.

You do not have to have an amplifier to generate IMD. Any electrical contact can cause rectification which will cause IMD. Rectification is a diode detector, diodes are also used as mixers because they are non-linear devices. Corroded or loose coax connectors or antenna joints can be generators of IMD products. More than one rusty fence and rusty downspout and even rusty tower joints have been IMD sources. Even in solid copper "hard line" used in commercial stations, a bad joint can cause IMD, and more serious problems.

It is for this reason that if you want to operate VSB, you must have the brick wall filter in the coax line to the antenna!

THE RECEIVER

Your TV set is a VSB receiver. What makes it a VSB receiver is the response of the IF stages. It may be accomplished with tuned circuits or a SAW filter, but the effect is the same. It does not matter if the antenna input is receiving a DSB or a VSB signal, the receiver detectors do not have a clue about the bandwidth of the transmitted signal. It is only the desired portion of the TV signal that is received and displayed. It is no different than operating a voice receiver which has a passband which ignores the second or part of the second sideband. As long as the essential components of the desired signal are present, you get the information.

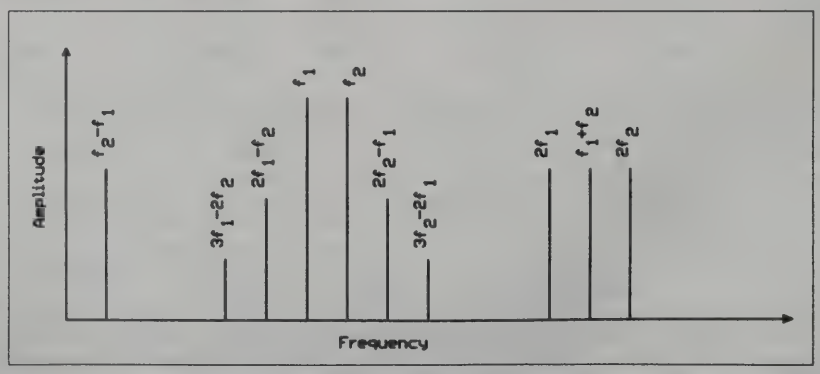


Figure 1. Frequency-domain relationships of the desired signals and low-order IMD products.

Thanks to RF Design for allowing us to use their IM digram.

THE TRUTH ABOUT VSB TRANSMISSIONS INTERMOD AND AMPLIFIERS

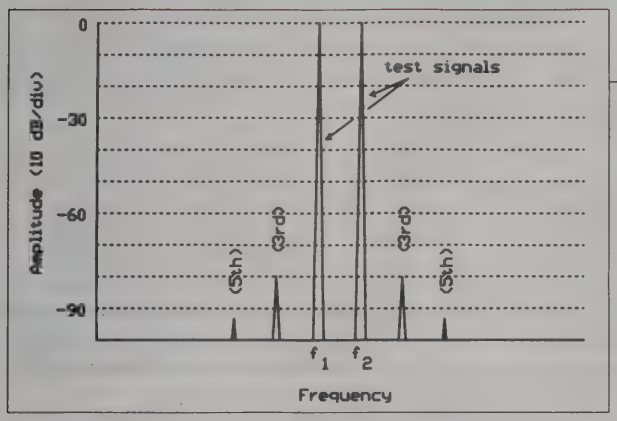


Figure 2. Typical two-tone test display of a mixer (observed at the IF output). A small-signal amplifier test would be similar.

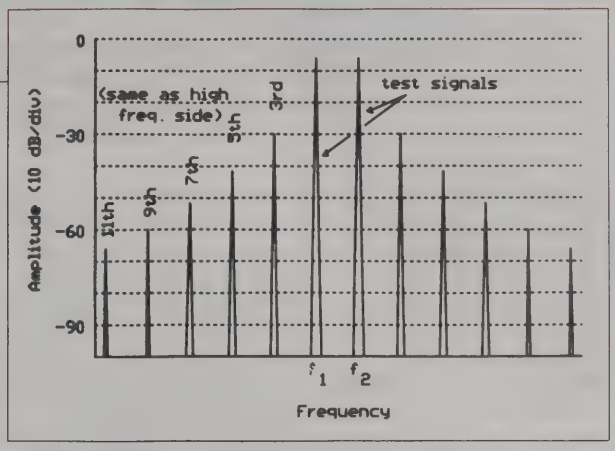


Figure 3. Two-tone IMD testing of a Class AB linear amplifier would look similar to this display.

Thanks to RF Design for allowing us to use their IM digram.

DOESN'T VSB MEAN MORE POWER?

NO! A properly operating amplifier does not change its power output between VSB and DSB signals. An amplifier is a fixed gain device. It does not vary its gain (unless you have an AGC circuit) due to the signal input. If the amplifier has 13 dB gain, it has 13 dB gain for all signals. A non linear amplifier may have 13 dB gain for a 1 watt input signal and a 10 dB gain for a 10 watt input and a 5 dB gain for a 40 watt input level. But within any power level, the gain is constant. A 1 watt VSB signal should receive the same gain as a 1 watt DSB signal. If the gain is 13 dB, all signal components will be amplified by 13 dB. If the amplifier exhibits gain compression, it is not linear! In that case, the higher power input signal components will be amplified LESS than the lower power input signal components.

Since SYNC represents the highest power of the TV signal, and the sidebands a much lower in power a non linear amplifier will reduce the SYNC level output power and the lower sidebands will not be compressed (or compressed as much). The compressed gain causes compressed (low) sync amplitude. Since the sidebands are insignificant most of the gain change will be caused by the power of the input sync level.

The cure is to lower your input signal until the sync is not compressed. The alternative is to introduce a pre-distortion of the signal which mirrors the compression non-linearity of the amplifier. In other words, use a sync stretcher. A worst case amplifier is the Klystron which is very non linear and requires a lot of signal pre-correction (or pre distortion) to produce a linear output signal.

The elimination of the undesired sound carrier and color energy prior to the non-linear amplifier might eliminate 10% of the total power input. If the amplifier gain is so non-linear that the 10% input reduction in instantaneous power causes an observable improvement in the output signal, it is not likely that the rest of the signal is very clean either as the IMD products are likely much higher. And additional power is more likely IMD products.

ATVQ, QUALITY WORTH REPRINTING!

Over the years, ATVQ has received many requests to reprint various items in other publication. Those of you who read Radio Electronics should have spotted a reprint of a color-bar article by Tom WB6P which appeared in our October 90 issue. Several clubs have written indicating they would like re-print permission and we have sent back letters indicating they may do so. We have also noted several ATVQ items in other magazines which have appeared without permission. Kindly take note that ATVQ is Copyright and no commercial publication may reprint without prior written permission from ATVQ. Club newsletter editors should send a request on club letterhead requesting to reprint a specific article, or articles of interest (blanket permission) which may appear. In return all we ask is that the club newsletter indicate the source of the material.

We would appreciate receiving a copy of the newsletter for our files. This is necessary as we have also had a very few reprints from other publications which we cannot authorize to be re-printed. You must obtain permission for the original copyright holder which is indicated in the article.

We recently received a foreign publication which lists articles of interest in various ham magazines. We were pleased that ATVQ was listed in 27 entries! 73 Magazine was listed for 49 entries. There were no other US publication listings! It is nice to have our work appreciated and valued enough to be selected reading for foreign hams who frequently cannot afford the cost of subscriptions to the US ham magazines.

VSB FILTERS

What is a VSB filter and how can I make one or where do I buy one?

A VSB filter is most easily expressed as a simple band pass filter. The pass band is not symmetrical around the video carrier, but is off-set to favor one side and disfavor the other side. What this means is that on a 439.25 MHz ATV signal, the video carrier is at 439.25 MHz. The VSB filter would be tuned to pass 438-444 MHz. This would allow the vestigial portion of the lower sideband and all of the upper sideband, upper sound and upper color information to pass.

The filter can be done in several ways. In Broadcast equipment and in the AEA FSTV 450 transmitter, a SAW filter is used at an IF frequency. This is usually around 45 MHz. but the frequency is chosen for the application. This video modulated signal is then up-converted to the operating frequency and is followed by a linear (class A or similar) RF amplifier to boost the power but to keep the sidebands that were just filtered out as low as possible. The final output should then go through a second filter if any additional RF stages are added.

A second method is called phasing. In this system both the driver and final stage are video modulated. Because of the phase delay and difference between the modulation applied to the final amplifier is different than the phase of the modulated RF coming from the driver stage, a cancellation occurs. By choosing components carefully, the phase cancellation can be quite effective. The disadvantage is that as soon as you change carrier frequencies, the phase changes and the attenuation of the undesired sideband is reduced.

The safest way is to put a filter on the output. Nearly all TV stations have a bandpass filter and additional notch filters to reduce the undesired sideband signals to meet Broadcast FCC regulations. We could do this in ham TV, but the levels are insignificant (your 100 watts vs the typical 5 Megawatt UHF broadcast signal) and the cost can be high if you do not build your own.

The output filters can be of the "resonant cavity" design similar to those used for voice repeaters, but more often are of the interdigital design. An inter-digital filter gets its name from its resemblance to holding our hands together with the fingers alternating (interspersed). The filter is a metal box in which rods extend from one edge to near the other edge. The rods are attached to alternating sides and are odd in number. For example the first rod would be attached to the "left" side, the second from the right, third on the left, fourth on the right, fifth on the left. The input and output are connected to the correct impedance point on the first and last rods. Typically at 450 MHz, about .5" from the "ground" end of the rod. In some designs the end rods are larger diameter and end fed rather than shunt fed.

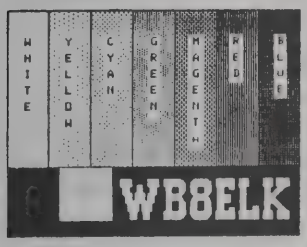
Opposite the un-attached rod ends of each rod is a short screw which acts as a tuning capacitor to adjust the response of the filter. The filters are adjusted with a sweep signal and spectrum analyzer.

There is also a similar design called a comb-line filter in which the rods are of different lengths rather than being all the same length.

The only two considerations in choosing or making a filter is the actual frequency of use and the power handling ability. Two US companies provide ham TV interdigital filters, International Crystal Manufacturing of Oklahoma City, OK and Spectrum International of Concord, MA. There is one manufacturer of the comb-line filter, TX-RX of Angola, NY.

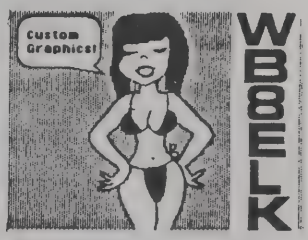
ELKTRONICS

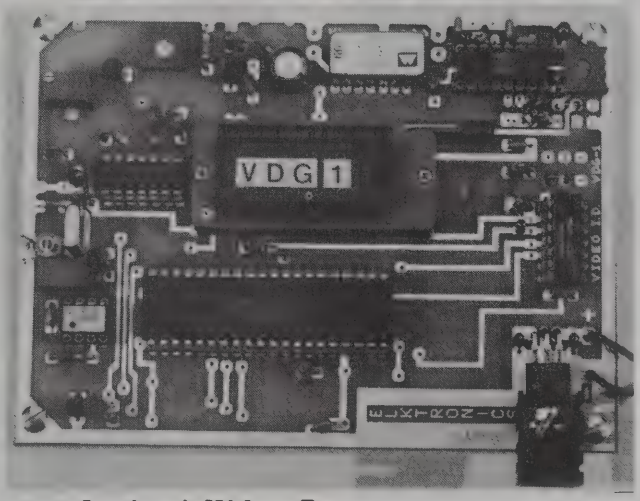
12536 T.R. 77
Findlay, OH 45840
(419) 422-8206



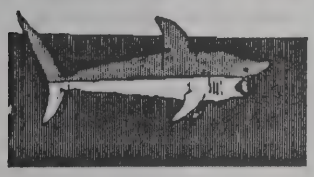
INTRODUCING THE
VDG-1

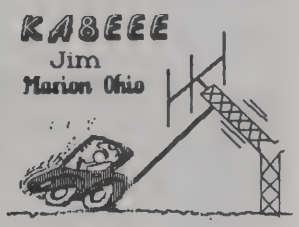
VIDEO I.D.



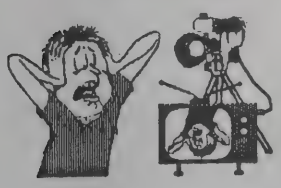


KA0JAW



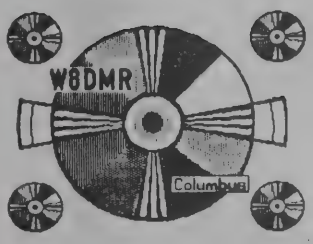


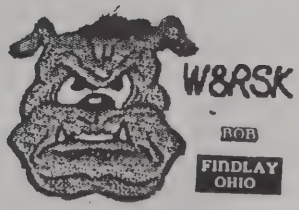
N9CAI /r



KA8ZNY

- Instant Video Source
- 4 Graphics Screens
  (2 Hi-RES / 2 Colorbar)
- 12 V D.C. Operation
- Video Relay for switching in
  live camera video
- Built-in Sequencer/Timer
  (Steps through all 4 screens)





VDG-1 with Pre-Programmed Custom Callsign Logo
– $99 ppd.

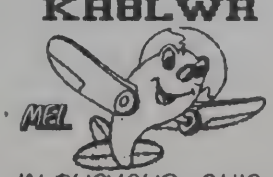
(Quick-release socket option)
– $10

Call or Write for CATALOG of available Graphics

Additional Programmed EPROMS
– $19

Now available as a Kit
– $89 ppd. Blank PCB – $19

KA8LWR



IN BUCYRUS, OHIO

KA8WLV
WHERE NO ATV'ER HAS GONE BEFORE

BOZEMAN, MONTANA ATV SCHOOL DEMO

by Neil Ramhorst KL7JGS

On October 3, 1991 local ATVers Neil KL7JGS, Fred KK7Y and 6th grade teacher Carol Westberg KJ7C, along with others from the Gallatin Valley Ham Club set up a demonstration of ATV and 2 meters for prospective student hams at the newly formed Chief Joseph Middle School.

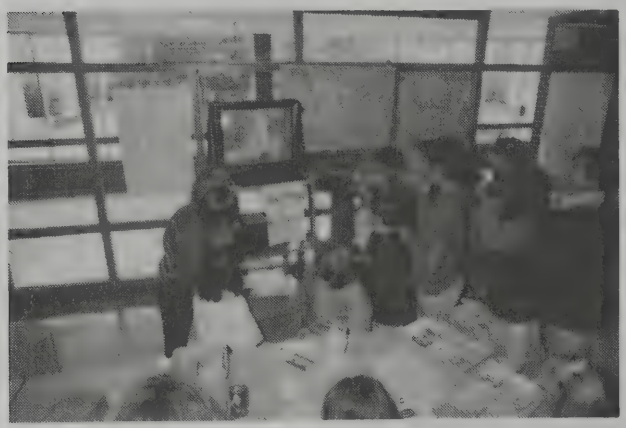
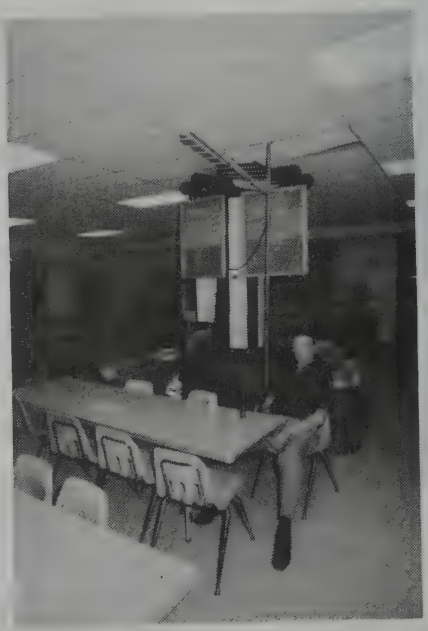


Photo A. Students at Chief Joseph Middle School gather around the ATV receiver and monitor to watch action at the other end of the cafeteria. (Photos by Neil Ramhorst KL7JGS).

Photo B. Fred KK7Y rests after a busy demo. The ATV equipment can be seen in the background mounted near the ceiling.



The demonstration consisted of transmitting a picture of students in line at the cafeteria to students eating at the other end during their three lunch periods. To prevent accidents with the equipment, the camera, the FS-430 ATV transceiver and a small beam antenna were mounted up near the ceiling with a large C-clamp and duct tape. A second FS-430 was positioned on an A/V (audio-visual) cart with a large TV near the tables where the kids were eating.

The demo was a roaring success! Students loved seeing and recognizing fellow students, and 2 meter simplex QSOs with friends added to the "wow factor". The demo helped to get the new Ham Club at the school off to a terrific start, with 25 students and 1 parent showing up for the first radio class.

Plans are under way to equip a permanent ATV station at the school to help keep up the enthusiasm until students can get their own licenses.

A few notes to new ATV groups like ours that may be planning to ATV demonstrations. Keep in mind the acronym KISS (Kiss It Simple Stupid). Our first demonstration at a triathalon was a complete failure and embarrassment. Equipment failure and too long a transmitter path left us with a blank screen and a large crowd to watch it! The audio portion of the demonstration in some instances will be unusable because of the background noise level, as in the cafeteria. Be prepared to let the picture do the speaking. And finally, put up brightly colored signs identifying equipment and what you are doing; it will help attract attention.

D.A.R.A. BALLOON # 2

After the initial success of the Dayton Amateur Radio Association's first ATV balloon last June 29th, members of the Dayton Amateur Radio Association (D.A.R.A.) prepared for another flight to the edge of space on the morning of October 6th, 1991.

The Payload

This time a high resolution Chinon B/W camera (similar to the GBC CCD-100 and the Micro Video Products camera) was installed in the hopes of getting some really great views from the edge of space. This package carried three transmitters: a 1-watt P.C. Kreepie- Peepie ATV transmitter on 439.25 MHz to a Little Wheel antenna, a Hamtronics TA-51 2m FM transmitter on 144.34 MHz and a Ramsey QRP-20 1-watt CW transmitter on 14.035 MHz using a vertical dipole. On-screen telemetry showing the altitude, callsign and outside temperature was displayed through the use a High Technology Flight video overlay board and telemetry computer. In addition, a GLB CW identifier sent out QSL information via the 20 meter transmitter (the last flight was heard all over the country and netted at least one report from Austria). On two meters, a continuous voice message sent out a greeting from the W8BI group.

Pre-Launch

A weather bureau radiosonde site was chosen for the launchsite in the Huber Heights area (just northeast of Dayton). What better location than a high altitude balloon station that sends up two packages each day for upper level wind and temperature observations. Although the weather looked pretty grim the evening before, conditions couldn't have been better as a few earlybirds gathered at the site to witness the morning radiosonde takeoff at 7 a.m.

Radiosondes transmit a series of tones which indicate pressure level, humidity and temperature as a wideband FM signal on 1680 MHz. Since they are not crystal controlled they can drift plus or minus about 5 MHz during the flight (they usually stay within 2 MHz or so). A few adventurous members of the Indianapolis foxhunt group decided to actually attempt to recover the sonde as a warmup for the ATV flight which was scheduled for liftoff two hours later.

Right at 7 a.m., Tom White sent up the radiosonde (he's launched over a thousand of these in his career). It was a picture perfect liftoff with absolutely no wind whatsoever. Paul W9DUU, Tom N9DZJ and Keenan N9HCK gave chase. Paul and Tom were using an AOR AR-3000 scanner in wideband FM mode with a coffee can antenna. Keenan used an ICOM R-7000 with a similar antenna. Unfortunately, the jet stream was directly overhead and the radiosonde balloon quickly outdistanced them. However, it did give the chase team a chance to locate near the projected landing site (over 100 miles away) and wait for the ATV package to drop on them.

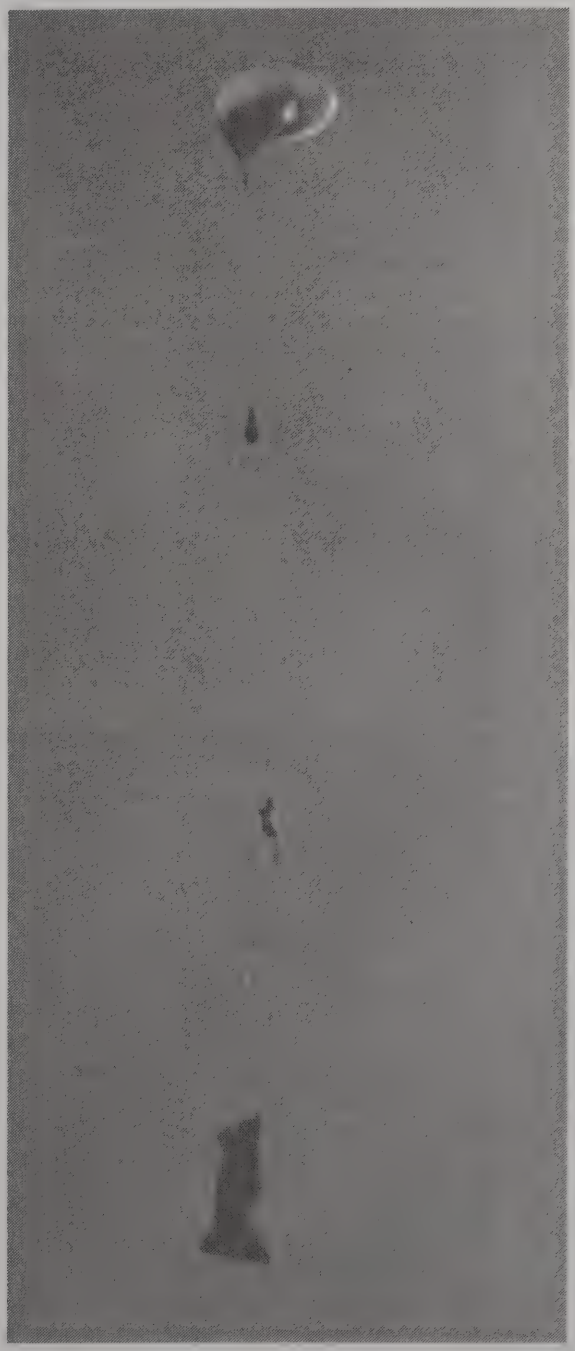


Photo C. Liftoff! The large object at the bottom of the flight train is the mylar radar reflector.

D.A.R.A. BALLOON # 2

Liftoff of the ATV package

As the 9 a.m. liftoff time approached, everyone was grateful that Mother Nature decided to give us a break with a beautiful calm morning. Guess again! Just as the balloon inflation started, the first gusts of wind began. The larger the balloon became, the higher the winds! Since the balloon was bigger than the type used by the weather bureau, it had to be inflated outside. We tried to use the inflation/tracking building for a windbreak, but it whipped around the building and caused the balloon to bounce up and down like a punching bag. At one point it came within 1 inch of hitting the rough edges of the building (certain balloon death) and at times it would stretch out over 20 foot high!

In a race against the ever-increasing winds (at times 15 knots or more), the balloon was successfully launched (although Dave AH2AR/8 almost went along for the ride). He had to do a somersault to avoid getting caught up in the large mylar radar reflector.

Photo E. D.A.R.A. members re-adjust the ladder-mount ATV receive antenna. (l to r): Mark N8COZ, Greg KB4TLH, Jeff N8IBW, Dan N8KCM, Vic N8FDF, and Charlie KA8OQF.

Spectacular Views

Everyone gathered around the ground station to view the spectacular views from the balloon's TV camera. The camera was mounted with a 45 degree downtilt which presented us with fantastic detailed views of the Ohio countryside. The launchsite was a few miles away from Wright-Patterson Air Force Base. At 11,000 feet, we could see the whole base and runway system as the balloon flew by. Fortunately they didn't try to use the balloon for target practice!

Once in the jet stream region, the package achieved ground speeds in excess of 130 mph! It didn't take long for it to trek along across a good portion of the state. At 100,000 feet, you could actually see part of the Lake Erie shoreline near Cleveland (the balloon was about 40 miles south of the lake at that point).

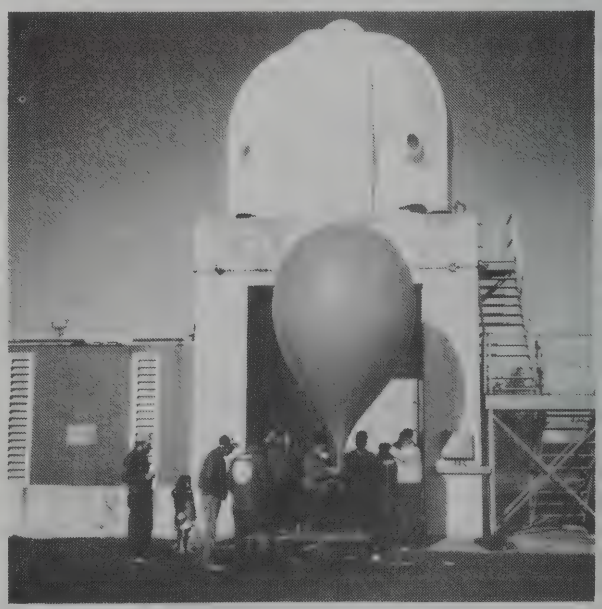


Photo A. Inflation of the balloon outside the radiosonde launch and tracking station. A peaceful moment just before Mother Nature let us have it!

Signal Reports

It's always a challenge to find a clear spot on the 40 meter band for the tracking net. In the past 7.155 MHz has been used, but since its in the Advanced portion, it eliminated some from checking in. Why not work out something with an existing net? A well-established net (MIDCARS) operates on 7.258 MHz. The MIDCARS group volunteered to handle the balloon reports and updates during the flight. This worked out beautifully and brought in a number of reports from folks who normally check in with MIDCARS who otherwise wouldn't have known about the flight. Excellent reports came in all across the midwest during the flight. Henry KB9FO had a P2 in Chicago (350 miles away)and Dick WA3USG saw a P3 signal as far east as Mechanicsburg, PA (380 miles).

D.A.R.A. BALLOON # 2

The two meter voice message worked out great. It periodically announced the ATV frequency during the flight. In fact a number of ATVers didn't know about the flight and discovered it by accident when they heard the 2m FM message! The Buffalo, NY ATV group usually meets every morning to swap video. Casey W2OSW saw the video signal coming in from the southwest and heard something on the 2m calling frequency. Thinking that the band must be open to Cleveland or Erie, they all pointed their beams in that direction. They were quite surprised to see the balloon ATV signal instead (at times P3 to P4 even into Niagara Falls, Canada - VE3BHH). George N3EQE of the Butler, PA area reported that his group discovered the signal by accident as well when they heard activity on the 144.34 calling frequency. Canadian ATVers as well as the Buffalo group were especially thrilled that this balloon drifted so far to the northeast. Excellent reports came in from VE3JO and others of the London, Ontario group.

A Wild Ride

Most of the launch team had congegrated at the W8BI club station (a couple of miles from the launchsite) to watch the fabulous pictures coming down from their package. Even though the package was over 100 miles away they had P4 to P5 reception with just a small beam sitting on a ladder in front of the building.

At 107,000 feet the balloon burst over Mansfield, Ohio. For an instant, we could see bits of the balloon fly by the camera lens followed by the parachute. Then things went wild! Apparently the parachute had ripped apart and the radar reflector tangled up in what remained of the chute. The package flipped over on its side and fell in a gyrating flat spin. The curvature of the Earth could be seen clearly spinning by as the package descended in a near free fall. At about 25,000 feet the remains of the parachute acted as a streamer and slowed the package down to an acceptable rate. We could now see a small white cloud directly below that kept getting larger and larger at a very fast rate!

Payload Found!

Since the package dropped so fast, it didn't drift nearly as far as predicted. The awaiting chase team had to back pedal to get near the landing site. Paul W9DUU, Tom N9DZJ and Keenan N9HCK headed in from the north and east while Larry WB9YAJ and Dan N9KZH drove up from the south. Just to give you some idea just how fast the package was travelling while in the jet stream, Larry and Dan had driven flat out just after liftoff and were still over 15 miles away when the payload landed. Dan N9KZH hopped off of the freeway and found the package just a few miles down a small highway lying right in the middle of a field. It couldn't have picked a better spot to land. The two meter and 20 meter transmitters were still functional but the ATV transmitter took the brunt of the impact. One of the electrolytic capacitors had been ripped out and the crystal bent over. Fortunately it was easily fixed. The landing site was about 6 miles southeast of Mansfield (about 105 miles from the launchsite).

Look for future efforts from the DARA group. They will probably add a number of interesting experiments for their next flight.

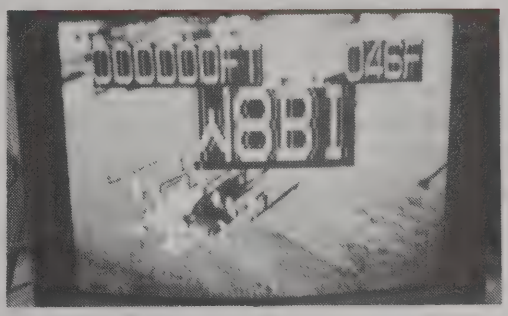


Photo F. Live camera downlink of the launch site just after takeoff.

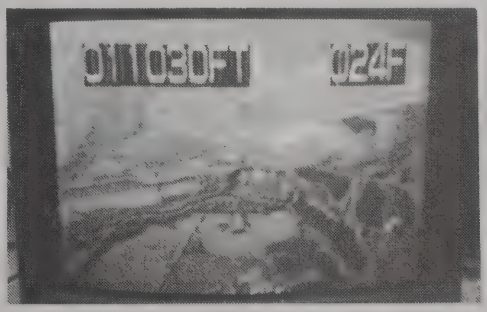


Photo G. A spectacular view of Wright-Patterson Air Force Base as seen from the balloon at 11,030 feet.

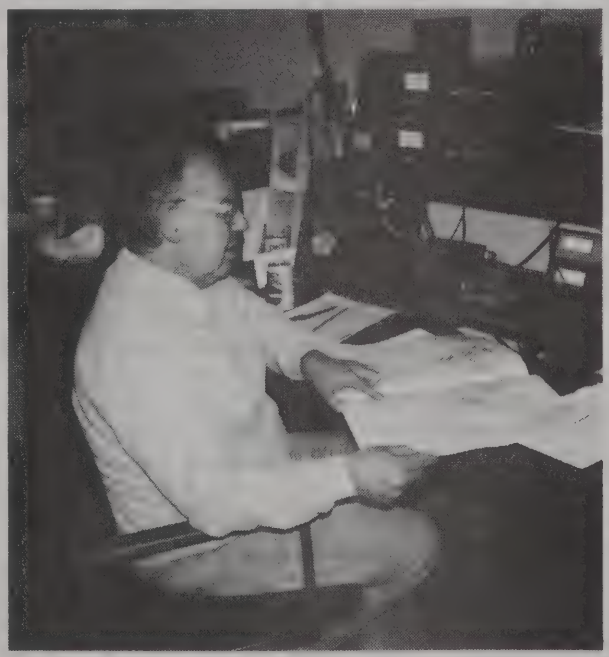


Photo D. Vic N8FPF relays the balloon's position to the tracking net from the W8BI club station.

ECLIPSE BALLOON

San Clemente, CA

Bill WB8ELK

A dramatic annular eclipse of the sun occurred this past January 4th along the coast of Southern California just minutes before sunset. An annular eclipse is a variation of a total solar eclipse which occurs when the diameter of the moon doesn't completely cover the solar disk. The end result is a spectacular ring of fire surrounding a dark center.

Mike KC6CCC and Mike WA6SVT prepare the payload for liftoff.

Since the weather during January has about a 50-50 chance of being favorable, Mike Henkoski KC6CCC, Mike Collis WA6SVT and I decided to stack the odds in our favor and attempt to watch the eclipse from the stratosphere (above the clouds) with an ATV balloon.

We all assembled at Mike Henkoski's QTH the night before the eclipse with a large pile of parts and began a 24-hour marathon session of payload construction. We televised hourly updates via the WA6SVT ATV repeater on Santiago Peak, showing each phase of the assembly process.

Just one hour before the eclipse, we finally had transformed a pile of miscellaneous parts into a mini-spacecraft. We also succeeded in transforming KC6CCC's formerly pristine shack into an absolute junkyard! Our final configuration consisted of a Microtek micro-TV transmitter (see the July '91 issue of 73 Magazine, page 9), the companion subcarrier sound board, a PC Electronics PA-5 power amplifier, a Micro Video products miniature B/W TV camera, a video ID board, an ICOM 2A HT, a 30 milliwatt 10 meter AM transmitter, and a voice IDer (see the November '91 issue of 73 Magazine).

The ATV antenna system was somewhat unique. Mike WA6SVT transformed a radar reflector into a quarter-wave vertical which would be suspended eight feet below the package during the flight. In addition, the shield of the ATV coax worked as half of the 10 meter dipole.

Mike KC6CCC shows the large crowd spectacular video from the balloon transmitter/camera.

In order to keep the package pointed at the sun, Mike KC6CCC designed a solar tracking system out of a pair of photo cells and a radio control servo. This servo controlled a large fin made out of a paper file holder. Whenever the package moved away from the sun, the fin would act as a rudder and try to steer the package back towards the sun. This system worked fairly well, but the movement of the fin was uneven and didn't lock onto the sun continuously.

In order to pan the camera view, we took an idea used by Joe Mayenschein WB9SBD. In an earlier flight, Joe mounted a mirror in front of his TV camera and rotated the mirror with a small motor.

ECLIPSE BALLOON

A large crowd assembled near the beach at a park in San Clemente as we inflated the balloon. They even stopped a nearby soccer game so the participants could watch the activities. Just 35 minutes before the eclipse, we finally had everything buttoned up and ready to go (final testing occurred on the park's picnic table!). There was absolutely no wind, so we could just reel out the balloon string and gently let go of the payload. If only all our launches were this easy! We brought along a portable TV so the spectators could see the fantastic views of the California shoreline which was transmitted down from the onboard TV camera. Gordon West WB6NOA also brought along his ATV receive station which generated a large viewing audience.

We have liftoff!!

Since we were flying with a 2 meter HT onboard, we used it to listen on 146.43 MHz and retransmit the audio out on the video subcarrier as well as the 10 meter transmitter (an AM modulated computer clock oscillator on 28.322 MHz). In essence, we had an airborne dual-output crossband repeater. Every 30 seconds the voice ID/timer circuit would key up the 2 meter transmitter for a short message to aid in tracking.

Activity was brisk through the crossband repeater as stations farther and farther away could be heard through the balloon repeater as it gained altitude. The 30 milliwatt mini-AM transmitter was heard as far away as South Dakota (Paul WQ0M) and in Wisconsin (Joe WB9SBD). We even had a fellow at the launch site listening in on his shortwave receiver.

The view from the balloon's TV camera was spectacular. The rotating mirror (two minutes for a complete revolution) gave us a continuous coverage of both horizons, the ground below, as well as the balloon straight overhead.

We gathered in KC6CCC's back yard to view the actual eclipse at sunset. John Hoot N6NHP (of Software Systems Consulting) had a telescope set up with a video camera to tape the event. Although we did see the full eclipse for a very brief time, it was partially covered by clouds. The Los Angeles area didn't even have a chance due to a solid overcast just to our north.

All components were mounted on an aluminum plate.

After sunset, we rushed inside to see how the balloon video was doing with the eclipse. Even though it was rapidly getting pitch dark on the ground, the balloon camera could still see the sun. At 40,000 feet, sunset would not occur for another 20 minutes! We should have used a solar filter in front of the TV camera, as the brightness of the sun was overloading the camera even during the maximum eclipse. It was still quite fascinating to see a sunset from the stratosphere!

The 6-watt ATV transmitter worked quite well. Snow-free reception of the signal was reported from most of Southern and central California. Pat W6YEP in Fresno reported P-5 results for most of the flight (280 miles). Norm WV7K and members of the AAA5 club in Phoenix, Arizona (300 miles), had nearly P-5 reception (the IDer was in full color) with perfect subcarrier sound for over an hour.

The crossband repeater worked well for the first 30 minutes of the flight, however the cold temperatures caused the timer board to malfunction resulting in a continuous loop of the voice ID. I'm sure the Southwest is a little tired of my voice by now, but it did help the T-hunters track down the payload since the 2 meter transmitter was on continuously.

ECLIPSE BALLOON

Before the flight, I contacted Scott Bovitz N6MI and Joe Moell K0OV of the southern California T-hunt group. If anybody could track down and recover the payload, it would be this group. No matter what the circumstances, I knew they would find a way to locate the landing site of the package.

The computer prediction showed that the payload would land about 50 miles to the east-northeast. This was an area of rugged mountains with very few passable roads. To top it off, the balloon would be landing at night! A definite challenge to the T-hunters. As the balloon came down, the T-hunters had its location pegged right down to the point of touchdown. With Kuby N6JSX coordinating the mobile trackers via a repeater, they quickly converged near the top of Little Thomas mountain (about 5,000 feet high) and re-acquired the signal in short order. Unfortunately, they couldn't get much closer than a mile or two on any of the roads (a lot of vehicles got stuck getting to this point).

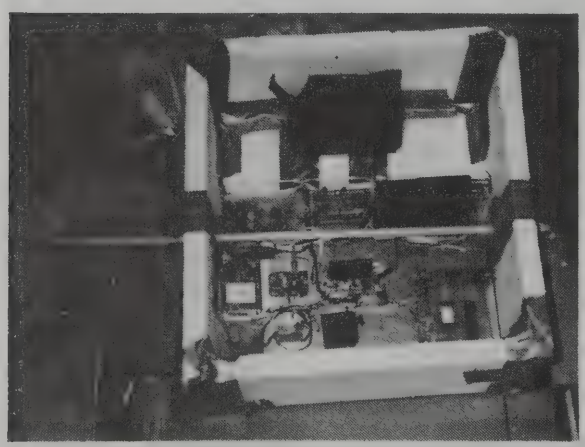
Imagine crashing through dense Manzanita brush in the middle of the night on a freezing cold mountain while trying to track down a hidden transmitter. After the storm hit in the wee hours of the morning, they had to give up the hunt until the weather improved. It was a challenge just to find their way back to their vehicles!

Although the ATV portion of the payload died out after five hours, the 2 meter HT and the 10 meter transmitter were on a different battery system that would last several days. Fortunately, it was still transmitting two days later (the first good day after a large storm pelted the area). As the T-hunters closed in, the signal suddenly appeared to be moving. Apparently the balloon package had grown legs and was walking out on its own! A local resident had found the payload and carried it back to his cabin. The T-hunters tracked him down and rescued the package.

Even after sitting out in the snow and rain for over two days, the payload was in perfect shape. The film from the onboard 35mm film camera was rushed to the developers. The camera had taken only three pictures, however. One good sunset shot at 2,000 feet, and a couple of cloud pictures at 12,000 and 22,000. It apparently froze up after that. Not much solar radiation to keep it warm during an eclipse.

This was a fun flight that hopefully stirred up activity across the Southwest. I know at least one (possibly more) of the spectators at the launch site may be joining the ranks of hamdom as a result of watching the ATV receive station at the park.

I can't say enough about the sheer determination of the Los Angeles T-hunters. Without their incredible efforts, the package may never have been found. An excellent account of the balloon recovery effort can be found in the April '92 "Homing In" column by Joe Moell K0OV in 73 Amateur Radio Today.



An inside view.

Bill WB8ELK pumps up the balloon which is launched just 35 minutes before the eclipse. Photo by Susan Pond

ATV Coverage
1992 Rose Parade

Every year ATVers across Southern California join forces with members of the Tournament of Roses Radio Association (TORRA) to help cover the annual Pasadena Tournament of Roses Parade.

The Starship Enterprise float as seen from camera positions 6A/B.

Any event that brings in over a million spectators along a 5-1/2-mile route requires a massive support system to make sure things run smoothly. Anything could happen during the parade; the intricate floats can and DO break down, various medical emergencies crop up, and sometimes unruly spectators and even organized protestors impede the progress of the parade. Without proper communications, keeping the parade on track could be a logistical nightmare.

In order to help out with the communications effort, ATV camera locations were perched on top of several buildings (as well as the main viewing stand) along the parade route. From their rooftop vantage points, just about any part of the parade route could be seen by zooming in on the trouble spot. Twenty-four ATVers at nine remote camera locations and mission control took part (see the sidebar). The ATV net control station (Koichi KB6EL) communicated with the remote camera sites via the 145.18 MHz telephone company club repeater.

In order to send the video back from each site over such a large route, each camera location would transmit on 434 MHz back to the WA6SVT/KI6VK ATV repeater (the Crestline Amateur Television Network repeater was borrowed for the parade) which was centrally located on top of the telephone building. The repeater received the remote camera video on 434 MHz and retransmitted it out on 919.25 MHz. From this central hub repeater, the signal could be received by any of the command centers that needed to observe the parade.

ATV Receive sites were located at ATV net control in the command trailer, TORRA command, the media room, public safety and the city of Pasadena Sheriff's Department. In addition, most of the remote camera locations had 919.25 MHz downconverters so that they could watch the other remote cameras coming through the repeater.

If any of the centers needed to see a particular part of the parade, they just had the ATV net control station ask the nearest camera site to transmit.

Throughout the course of the parade, each camera crew got their chance to zoom in on a trouble spot. One of the floats veered off course and nudged into the crowd, and some mechanical breakdowns of the floats were observed (a couple needed towing). ATVers even had the opportunity to point out one recurring trouble area. Since the theme of the parade was the 500th anniversary of the discovery of America by Columbus, a number of Native Americans were set up at one spot along the parade route in protest. They even delayed the parade for a short time. Whenever an equestrian group passed, the Indian group would beat on tom-toms, which caused at least one rider to be thrown off his horse. As a result, a contingent of police lined the streets along this portion of the parade to help maintain order.

Several of the rooftop ATV locations had good views of the area, which helped parade officials keep on eye on the

1992 ROSE PARADE ATV COVERAGE

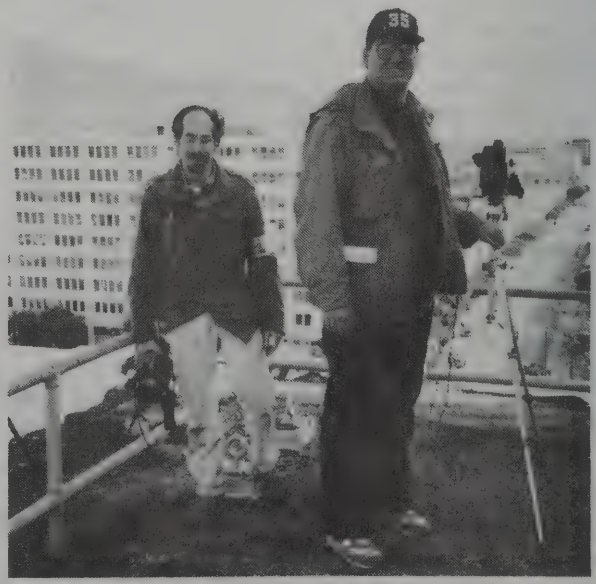
Several of the rooftop ATV locations had good views of the area, which helped parade officials keep on eye on the disturbance. The ATV effort worked well throughout the parade, and certainly helped parade officials keep track of the parade in an effective way that would not have been easily done through other means.

This kind of activity really helps demonstrate the value of amateur radio to your local community. If your ATV group offers assistance for a public event, or if you use ATV in support of a special activity, I'd like to hear about it. Also, if you've built a video device, circuit or gadget that enhances your ATV station, send me a description or schematic so we can share it with our readers.

Members of the TORRA mission control team.
Front row l to r): Koishi KB6EL - ATV net control, and Mike WA6SVT.

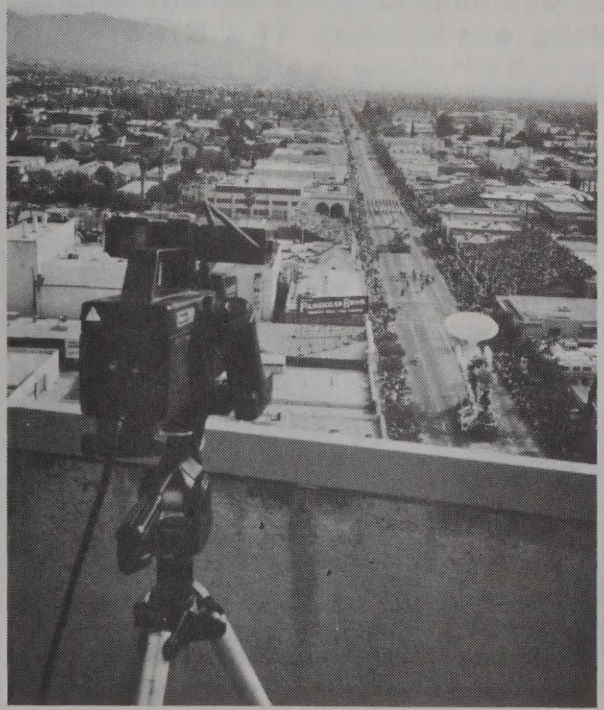
Cam KI6VK mans the portable ATV repeater site at camera #4.

Frank K1HHM and Dick WA6BYJ at camera 6B.

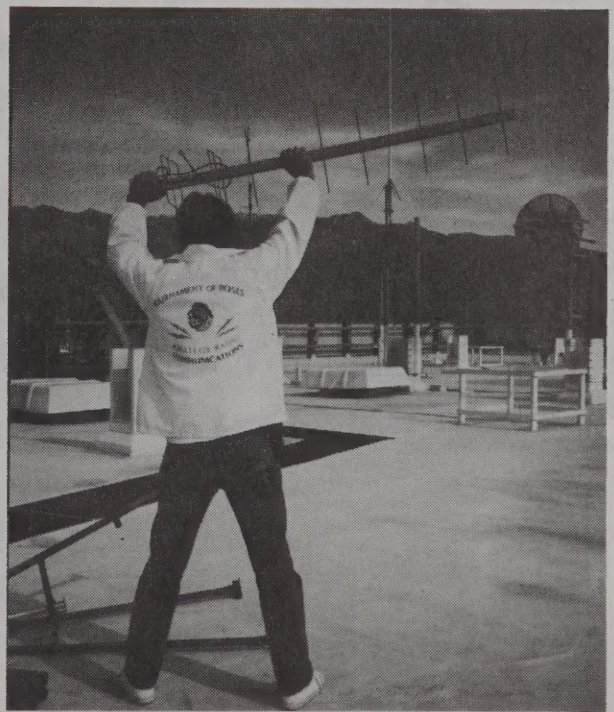


Camera 5: Mark Shlosberg and Doug WB6KNY.

1992 ROSE PARADE ATV COVERAGE



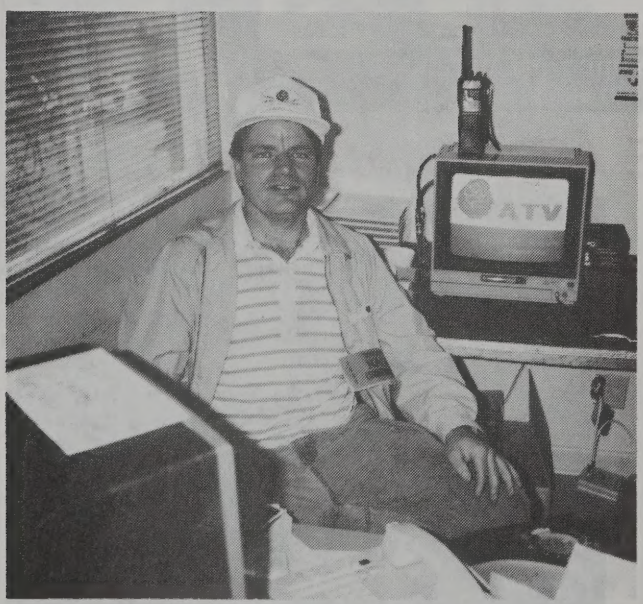
Parade route as seen from the rooftop vantage point of camera 6B.



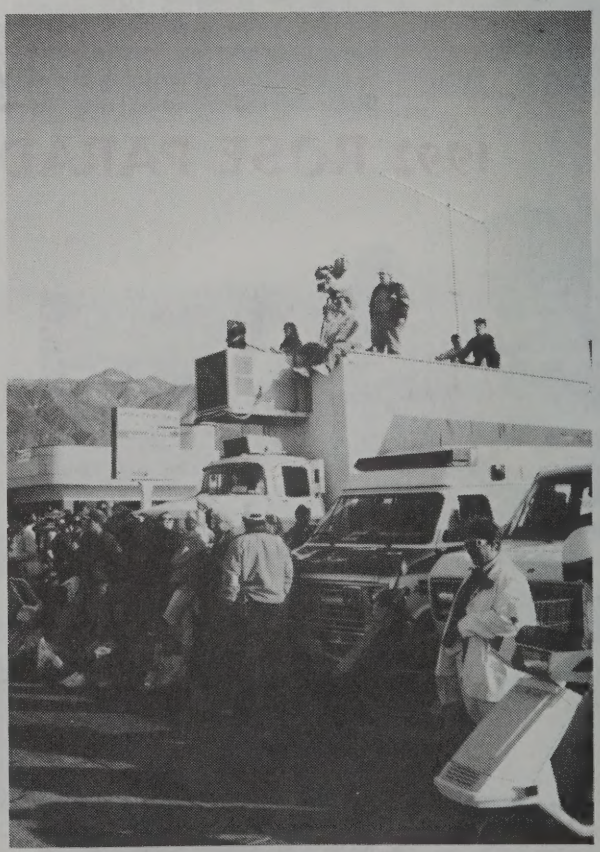
Human antenna rotor Barry KC6OXK peaks up reception at camera 4.

1992 ROSE PARADE ATV COVERAGE

Jim KC6TFV in his mobile video studio at camera 10.



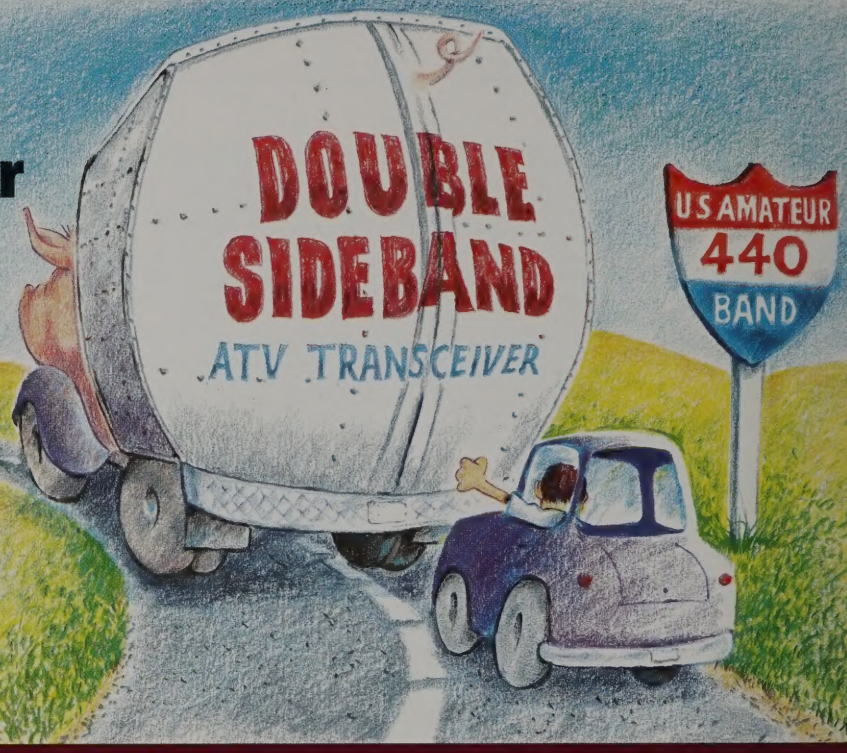
Mike WA6SVT, troubleshooter, checks out reception at the media center.



Jeff N9CZA on top of the video production van at camera #10.

Don't Be An Amateur Band Hog.

If you're using a traditional double-sideband (DSB) Amateur Television transceiver, you're, in effect, hogging the band. DSB not only wastes power on the unused sideband, but uses almost twice the spectrum necessary. Not good, considering how limited the spectrum is to begin with.



VSB-70 with Vestigial Sideband

The VSB-70 from AEA is the only amateur television transceiver that uses Vestigial Sideband (VSB), the same modulation method used by commercial TV stations. Our VSB technology reduces the unwanted sideband over 40dBc! More power where it should be and less wasted spectrum space.

Also available is the RLA-70 mast-mount linear amplifier (with power supply), which boosts your signal while preserving the characteristics of VSB.

Be a good spectrum neighbor. Use the AEA VSB-70 ATV System.

For a complete specification sheet on the VSB-70 or any other product, call 1-800-432-8873.

Advanced Electronic Applications, Inc.
P.O. Box C2160/2006 196th St. S.W. • Lynnwood, WA 98036
Tech Support & Sales (206)775-7373 • Office (206)774-5554
CompuServe User ID 76703, 1012 • Brochure InfoLine (800)432-8873